



NCERT NOTES

GEOGRAPHY

12th Standard

India People and
Economy



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Unit: I



1

Population: Distribution, Density, Growth and Composition

India is the second most populous country after China in the world with its total population of 1,210 million (2011). India's population is larger than the total population of North America, South America and Australia put together.

Distribution of Population:

India has a highly uneven pattern of population distribution:

- **Uttar Pradesh** has the **highest population** followed by Maharashtra, Bihar, and West Bengal.
- The share of population is very **small** in the states like Jammu & Kashmir (1.04%), **Arunachal Pradesh (0.11%)** and Uttarakhand (0.84%) in spite of these states having fairly large geographical area.
- Close relationship between population and physical, socioeconomic, and historical factors.
 - The North Indian Plains, deltas and Coastal Plains have higher proportion of population than the interior districts of southern and central Indian States, Himalayas, some of the north eastern and the western states.
- **Reasons for moderate to high Population in areas which were previously very thinly populated:**
 - The development of irrigation (Rajasthan).
 - Availability of mineral and energy resources (Jharkhand).
 - Development of transport network (Peninsular States).

Socio- Economic and Historical factors of Population Distribution:

Evolution of settled agriculture and agricultural development; pattern of human settlement; development of

transport network, industrialisation, and urbanisation.

- Though resources like land and water degraded in northern plains of India the concentration of population remains high because of the history of human settlement and development.
- Urban regions of Delhi, Mumbai, Kolkata, Bengaluru, Pune, Ahmedabad, Chennai and Jaipur have high concentration of population due to industrial development and urbanisation drawing a large numbers of rural-urban migrants.

Density of Population:

It is expressed as **number of persons per unit area**. It helps in getting a better understanding of the **spatial distribution** of population in relation to land.

- As per 2011 Census, the density of population is **382 person/sq. km**.
- **Very High-Density UT's:** The Union Territories (excluding Andaman and Nicobar Islands) have very high densities of population.
- **High Density States:**
 - **Among Northern States:** Bihar (1102), West Bengal (1029) and Uttar Pradesh (828).
 - **Among Peninsular States:** Kerala (859) and Tamil Nadu (555).
- **Moderate Density States:** Assam, Gujarat, Andhra Pradesh, Haryana, Jharkhand and Odisha.
- **Low Density:** The hill states of the Himalayan region and North eastern states of India (excluding Assam).
- The physiological and the agricultural densities should be found out to get a better insight into the human-land ratio in terms of pressure of population on total cultivable land.

Physiological Density = Total population/net cultivated area.

Agricultural Density = Total agricultural population/net cultivable area.

Agricultural Population includes cultivators and agricultural labourers and their family members.

Growth of Population:

- It is the **change in the number of people** living in a particular area between two points of time. Its rate is expressed in percentage.
- Population growth has two components:
 - **Natural Growth:** It is analysed by assessing the crude birth and death rates.
 - **Induced Growth:** They are explained by the volume of inward and outward movement of people in any given area.
- The decadal and annual growth rates of population in India are both very high and steadily increasing over time. The **annual growth rate** of India's population is **1.64 per cent** (2011).
- The growth rate of population in India over the last one century has been caused by annual birth rate and death rate and rate of migration and thereby shows different trends.

Four distinct Phases of Growth in India Phase One:

- The period from **1901-1921** is referred to as a **period of stagnant or stationary** phase of growth of India's population, since in this period growth rate was very

low, even recording a **negative growth** rate during **1911-1921**.

- Both the **birth rate and death rate** were **high** keeping the rate of increase low.
 - **Reasons:** Poor health and medical services, illiteracy of people at large and inefficient distribution system of food and other basic necessities.

Phase Two:

- The decades **1921-1951** are referred to as the **period of steady population growth**.
- An overall improvement in health and sanitation brought down the mortality rate.
- Better transport and communication system improved distribution system.
- The crude birth rate remained high leading to higher growth rate than the previous phase.
- The performance was impressive at the backdrop of Great Economic Depression, 1920s and World War II.

Phase Three:

- The decades **1951-1981** are referred to as the **period of population explosion** in India which was caused by a **rapid fall in the mortality rate** but a **high fertility rate of population**.
- The average annual growth rate was as **high as 2.2 per cent**.
- During this period developmental activities were introduced through a centralised planning process and economy started showing up ensuring the improvement of living condition of people at large. Consequently, there was a high natural increase and higher growth rate.

- **International migration** bringing in Tibetans, Bangladeshis, Nepalis and Pakistanis contributed to the **high growth rate**.

Phase Four:

- In the **post 1981 till present**, the **growth rate** of population remained **high** but has started **slowing down** gradually.
- A **downward trend** of **crude birth rate** is held responsible for such a population growth which was affected by an increase in the mean age at marriage, improved quality of life particularly education of females in the country. The growth rate of population is, however, still high in the country, and it has been projected by **World Development Report** that **population** of India will touch **1,350 million** by **2025**.

Regional Variation in Population Growth:

The growth rate of population during **1991- 2001** in Indian States and UTs gives following information.

- The States like Kerala, Karnataka, Tamil Nadu, Andhra Pradesh, Odisha, Puducherry, and Goa show a low rate of growth not exceeding 20 per cent over the decade.
- **Kerala** registered the **lowest growth rate (9.4)** in India.
- During 2001-2011, the growth rates of almost all States and UTs have registered a lower figure compared to the previous decade, namely, 1991-2001.
- The **percentage decadal growth** rates of the six most populous States: Uttar Pradesh, Maharashtra, Bihar, West Bengal, Andhra Pradesh, and Madhya

Pradesh have **all fallen** during 2001-2011 compared to 1991-2001.

- The fall being the **lowest** for **Andhra Pradesh** (3.5% percentage points).
- **Highest** for **Maharashtra** (6.7 percentage points).
- Tamil Nadu (3.9 percentage points) and Puducherry (7.1 percentage points) have registered some increase during 2001-2011 over the previous decade.

Adolescent Population:

- An important aspect of population growth in India is the **growth of its adolescents**.
- At present the share of **adolescents** i.e., up to the age group of **10-19 years** is about **20.9 per cent** (2011).
 - The **male adolescents** constitute **52.7 per cent**.
 - The **female adolescents** constitute **47.3 per cent**.

Challenges of Adolescents:

- Lower age at marriage.
- Illiteracy – particularly female illiteracy.
- School dropouts.
- Low intake of nutrients.
- High rate of maternal mortality of adolescent mothers.
- High rate of HIV and AIDS infections.
- Physical and mental disability or retardness.
- Drug abuse and alcoholism.
- Juvenile delinquency and commitment of crimes, etc.

The Indian government has undertaken certain policies to impart proper education to the adolescents:

- **National Youth Policy (NYP-2014):**
 - It was launched in February 2014 proposes a holistic vision for the youth of India.
 - The NYP-2014 has defined ‘youth’ as persons in the age group of **15–29 years**.
- **National Policy for Skill Development and Entrepreneurship (2015):**
 - It was formulated to provide an umbrella framework to all skilling activities and to align these to common standards and link skilling with demand centres.

Population Composition:

It is a distinct field of study **within population geography** with a **vast coverage of analysis** of age and sex, place of residence, ethnic characteristics, tribes, language, religion, etc.

Rural-Urban Composition:

- Composition of population by their respective places of residence is an important indicator of social and economic characteristics. It is very significant in country like India as **68.8 per cent** of its total population lives in **village** (2011).
- India has **640,867 villages** according to the Census 2011 out of which 597,608 (93.2 per cent) are inhabited villages.
- States like **Bihar** and **Sikkim** have very **high percentage** of rural population.
- **Goa** and **Maharashtra** have **only little over half** of their total population residing in villages.
- The Union Territories have smaller proportion of rural population, except

Dadra and Nagar Haveli (53.38 per cent).

- **Variation of size of villages:** It is less than **200 persons** in the hill states of North-Eastern India, Western Rajasthan and Rann of Kutch and as **high as 17 thousand persons** in the states of Kerala and in parts of Maharashtra.
- The proportion of **urban population (31.16 per cent)** in India is quite **low** but it is showing a much faster rate of growth over the decades.
 - The growth rate of urban population has accelerated due to enhanced economic development and improvement in health and hygienic conditions.
- It is noticed that in almost all the states and UTs, there has been a considerable increase of urban population.
- The rural-urban migration is conspicuous in the case of urban areas along the main road links and railroads in the North Indian Plains, the industrial areas around Kolkata, Mumbai, Bengaluru – Mysuru, Madurai – Coimbatore, Ahmedabad – Surat, Delhi – Kanpur and Ludhiana – Jalandhar.
- **Low Degree of Urbanisation:** In the agriculturally stagnant parts of the middle and lower Ganga Plains, Telengana, non-irrigated areas of Western Rajasthan, remote hilly, tribal areas of North-East, along the flood prone areas of Peninsular India and along eastern part of Madhya Pradesh.

Linguistic Composition:

- According to **Grierson (Linguistic Survey of India, 1903 – 1928)**, there were 179



languages and as many as 544 dialects in the country.

- In the context of modern India, there are about **22 scheduled languages** and a number of non-scheduled languages.
- **Among the Scheduled Languages:**
 - The speakers of **Hindi** have the **highest percentage**.

- The **smallest language** groups are Sanskrit, Bodo and Manipuri speakers (2011).

Religious Composition:

- The spatial distribution of religious communities in India shows that there is uneven distribution of people of different religions in different states and districts.

Table 1.1: Classification of Modern Indian Languages

Family	Sub Family	Branch / Group	Speech Areas
Austic (Nishadal) 1.38%	Austro – Astatic Austro- Neslan	Mon-Khmer Munda	Meghalaya, Nicobar Islands West Bengal, Bihar, Orissa, Assam, Madhya Pradesh, Maharashtra
Dravidian (Dravida) 20%		South- Dravidian Central Dravidian North Dravidian	Tamil Nadu, Karnataka, Kerala Andhra Pradesh, Orissa, Maharashtra Bihar, Orissa, West Bengal, Madhya Pradesh
Sino- Tibetan (Kirata) 0.85%	Tibeto- Myanmart Slamese- Chinese	Tibeto- Himalayan North Assam Assam- Myanmari	Jammu & Kashmir, Himachal Pradesh Sikkim Arunachal Pradesh Assam, Nagaland, Manipur, Mizoram, Tripura, Meghalaya
Indo European (Aryan) 73%	Indo-Aryan	Iranian Dardic Indo-Aryan	Jammu & Kashmir, Punjab, Himachal Pradesh, U.P., Rajasthan, Haryana, M.P., Bihar, Orissa, West Bengal, Assam, Gujarat, Maharashtra, Goa.

Table 1.2: Religious Communities of India, 2011

Religious Group	2011	
	Population (in million)	% of Total
Hindus	966.3	79.8
Muslims	172.3	14.2
Christians	27.8	2.3
Sikhs	20.8	1.7
Buddhists	8.4	0.7
Jains	4.5	0.4
Other Religious and Persuasions (ORP)	7.9	0.7
Religion Not Stated	2.9	0.2

- **Hindus** are distributed as a **major group** in many states (ranging from 70-90 per cent and above) except the districts of states along Indo-Bangladesh border, Indo-Pak border, Jammu & Kashmir, Hill States of North-East and in scattered areas of Deccan Plateau and Ganga Plain.
- **Muslims**, the **largest religious minority**, are concentrated in Jammu & Kashmir, certain districts of West Bengal and Kerala, many districts of Uttar Pradesh, in and around Delhi and in Lakshadweep.
 - They **form majority** in **Kashmir valley** and **Lakshadweep**.
- **Christian population** is distributed mostly in **rural areas** of the country.
 - The main concentration is observed along the Western coast around Goa, Kerala and also in the hill states of Meghalaya, Mizoram, Nagaland, Chotanagpur area and Hills of Manipur.
- **Sikhs** are mostly concentrated in **relatively small area** of the country, particularly in the states of Punjab, Haryana, and Delhi.
- **Jains and Buddhists**, the **smallest religious groups** in India have their concentration only in selected areas of the country.
 - **Jains** have major concentration in the urban areas of Rajasthan, Gujarat, and Maharashtra.
 - The **Buddhists** are **concentrated mostly in Maharashtra**.
 - ◆ The other areas of Buddhist majority are Sikkim, Arunachal Pradesh, Ladakh in Jammu & Kashmir, Tripura, and Lahul and Spiti in Himachal Pradesh.
- The other religions of India include **Zoroastrians**, tribal and other indigenous faiths and beliefs.

Composition of Working Population:

The population of India according to their economic status is divided into **three groups**, namely, main **workers**, **marginal workers**, and **non-workers**.

- It is observed that in India, the **proportion of workers** (both main and marginal) is **only 39.8 per cent** (2011) leaving a vast majority of about 60 per cent as non-workers.
 - This indicates an **economic status** in which there is a larger proportion of **dependent population**, further indicating possible existence of large number of **unemployed or under employed people**.
- **States with larger Percentages of Workers:** Himachal Pradesh, Sikkim, Chhattisgarh, Andhra Pradesh, Karnataka, Arunachal Pradesh, Nagaland, Manipur, and Meghalaya.
- **Among the UTs:** Dadra and Nagar Haveli and Daman and Diu have higher participation rate.

Occupational Composition:

- The occupational composition of India's population which actually means engagement of an individual in farming, manufacturing, trade, services or any kind of professional activities.

Occupational Categories: The 2011 Census has divided the **working population of India into four major categories:**

- Cultivators
- Agricultural Labourers.
- Household Industrial Workers.
- Other Workers.

- About **54.6 per cent** of total working population are **cultivators and agricultural labourers**.
- Only **3.8% of workers** are engaged in **household industries** and 41.6 % are other workers including non-household industries, trade, commerce, construction and repair and other services.
- The male workers out-number female workers in all the three sectors.

Promoting Gender Sensitivity through 'Beti Bachao - Beti Padhao':

- The **division of the society** into male, female and transgender is **believed to be natural and biological**. But there are social constructs and roles assigned to individuals which are reinforced by social institutions.
 - These **biological differences become the basis of social differentiations, discriminations, and exclusions**.
- The gender issue is a global challenge, which has been acknowledged by the **United Nation Development Program (UNDP)** when it mentioned that **"If development is not engendered it is endangered"** (HDR UNDP 1995).
- All efforts need to be made to address the denial of opportunities of education, employment, political representation, low wages for similar types of work, disregard to their entitlement to live a dignified life, etc.
- The Government of India has duly acknowledged the adverse impacts of these discriminations and launched a nationwide campaign called 'Beti Bachao - Beti Padhao'.

Female Labour Force Participation:

The number of female workers is relatively high in primary sector, though in recent years there has been some improvement in work participation of women in secondary and tertiary sectors.

Occupational Trend:

- The **proportion of workers in agricultural sector** in India has shown a **decline** over the last few decades (58.2% in 2001 to 54.6% in 2011). Consequently, the participation rate in secondary and tertiary sector has registered an increase.
- **Sectoral Shift:** There is a shift of dependence of workers from farm-based occupations to non-farm-based ones.
- **Spatial Variation of Work Participation Rate:** The highly urbanised areas like Delhi, Chandigarh and Puducherry have a very large proportion of workers being engaged in other services.
 - This indicates that large-scale urbanisation and industrialisation requires more workers in non-farm sectors.

Interesting Points:

- **Population Doubling Time:** It is the time taken by any **population to double itself** at its current annual growth rate.
- **Population Data:**
 - They are collected through **Census** operation held **every 10 years** in India.
 - The **first population Census** in India was conducted in **1872** but its **first complete Census** was conducted only in **1881**.
- **Religion and Landscape:**
 - Its formal expression is manifested through sacred structures, use of cemeteries and assemblages of plants and animals, groves of trees for religious purposes.
 - These may range from inconspicuous village shrines to large Hindu temples, monumental masjids, or ornately designed cathedrals in large metropolitan cities.
- **Standard Census Definition:**
 - **Main Worker** is a person who works for at least 183 days (or six months) in a year.
 - **Marginal Worker** is a person who works for less than 183 days (or six months) in a year.



2

Migration: Types, Causes and Consequences

Migration has been an integral part and a very important factor in redistributing population over time and space. The

history of India is a history of waves of migrants coming and settling one after another in different parts of the country.

Indian Diaspora:

During Colonial Period (British Period):

- Millions of the **indentured labourers** were sent to Mauritius, Caribbean islands (Trinidad, Tobago and Guyana), Fiji and South Africa **by British** from Uttar Pradesh and Bihar.
- To Reunion Island, Guadeloupe, Martinique and Surinam **by French and Dutch**.
- **By Portuguese**, People were sent from Goa, Daman and Diu to Angola, Mozambique to work as plantation workers.
- All such migrations were covered under the time-bound contract known as **Girmit Act** (Indian Emigration Act).

Second Wave of Migrants:

- They **ventured out into the neighbouring countries** in recent times **as professionals, artisans, traders, and factory workers**, in search of economic opportunities to Thailand, Malaysia, Singapore, Indonesia, and African countries, etc. and the trend still continues.
- There was a steady outflow of India's semi-skilled and skilled labour in the wake of the oil boom in West Asia in the 1970s.
- There was also some outflow of entrepreneurs, storeowners, professionals, businessmen to Western Countries.

Third Wave of Migrant:

- It was comprised **professionals** like doctors, engineers (1960s onwards), software engineers, management consultants, financial experts, media persons (1980s onwards), and others **migrated to countries such as USA, Canada, UK, Australia, New Zealand, and Germany, etc.**
- After liberalisation, in the 90s education and knowledge-based Indian emigration has made Indian Diaspora one of the most powerful diasporas in the world.

Migration

The **Census of India** gives information **about migration in the country**.

- Migration was recorded beginning from the **first Census of India conducted in 1881** which was recorded on the basis of place of birth.
- The **first major modification** was introduced in **1961 Census by bringing in two additional components: place of birth** i.e., village or town and **duration of residence** (if born elsewhere).
- Further in **1971**, additional information on **place of last residence** and **duration**

of stay at the place of enumeration were incorporated.

- Information on **reasons for migration** were incorporated in **1981 Census** and modified in consecutive Censuses.

Basis of Enumeration of Migration in Census of India:

- **Place of birth**, if the place of birth is different from the place of enumeration (**life-time migrant**)
- **Place of residence**, if the place of last residence is different from the place of enumeration (**migrant by place of last residence**).

As per 2011 census, out of 1,210 million people in the country, 455.8 million (**about 37%**) were reported as **migrants of place of last residence**.

Streams of Migration:

A few facts pertaining to the internal migration (within the country) and international migration (out of the country and into the country from other countries) are presented.

Streams under the Internal Migration:

- Rural to Rural (R-R)
- Rural to Urban (R-U)
- Urban to Urban (U-U)
- Urban to Rural (U-R)

Trends in Migration:

- In India, during 2011, out of 455.0 million migrants, enumerated on the basis of the last residence, 141.9 million had changed their place of residence in the last ten years.
 - Out of these, 118.7 million were intra-state migrants.

- The stream was dominated by female migrants. Most of these were migrants related to marriage.

- **Females predominate the streams of short distance rural to rural migration in both types of migration.**

- Contrary to this, men predominate the rural to urban stream of inter-state migration due to economic reasons.

- **Indian Census 2011** has recorded that more than **5 million persons** have **migrated to India** from other countries.
 - Out of these, about **88.9 percent** came from the neighbouring countries, **Bangladesh has highest share followed by Nepal and Pakistan.**

Spatial Variations:

- Some states like Maharashtra, Delhi, Gujarat and Haryana **attract migrants** from other states such as Uttar Pradesh, Bihar, Rajasthan, etc.
- **Maharashtra** occupied **first place in migrants**, followed by Delhi, Gujarat, and Haryana.
- On the other hand, **Uttar Pradesh** had the **largest number of net out-migrants** from the state.

Causes of Migration:

Push factor: They cause **people to leave their place** of residence or origin.

- In India people migrate from rural to urban areas mainly due to poverty, high population pressure on the land, lack of basic infrastructural facilities like health care, education, etc.
- The natural disasters such as, flood, drought, earthquake, tsunami, wars and local conflicts also give extra push to migrate.

Pull factors: They **attract the people** from different places.

- The rural migrants move to urban areas in search of better opportunities, availability of regular work and relatively higher wages.
- Better opportunities for education, better health facilities and sources of entertainment, etc., are also quite important pull factors.

Consequences of Migration:

Migration is a response to the uneven distribution of opportunities over space. Migration creates both benefits and problems for the areas, people migrate from and migrate to.

Economic Consequences:

- **Remittance sent by migrants:** Remittances from the international migrants are one of the major sources of foreign exchange. As per **World Bank report in 2019**, India received **\$83.1 billion**. Top states receiving remittances are Kerala, Andhra Pradesh, Tamil Nadu, Punjab, and Uttar Pradesh.
- The **amount of remittances sent by the internal migrants** is very meagre as compared to international migrants but it plays an important role in the growth of economy of the source area.
- **Negative consequences:**
 - The unregulated migration to the metropolitan cities of India has caused overcrowding.
 - Development of slums in industrially developed states such as Maharashtra, Gujarat, Karnataka, Tamil Nadu and Delhi is a negative

consequence of unregulated migration.

Demographic Consequences:

- Migration leads to the **redistribution of the population** within a country.
 - Rural urban migration is one of the important factors contributing to the population growth of cities.
- Age and skill selective out migration from the rural area have adverse effect on the rural demographic structure.
- **Negative:**
 - The high out migration from Uttarakhand, Rajasthan, Madhya Pradesh, and Eastern Maharashtra have brought serious imbalances in age and sex composition in these states.
 - Similar imbalances are also brought in the recipients' states.

Social Consequences:

- **Agents of Social Change:** The new ideas related to new technologies, family planning, girl's education, etc. get diffused from urban to rural areas through them.
- **Migration leads to intermixing of people from diverse cultures.** It led to evolution of composite culture and breaking through the narrow considerations.
- **Negative Consequences:**
 - Anonymity creates social vacuum and sense of dejection among individuals.
 - Continued feeling of dejection may motivate people to fall in the trap of anti-social activities like crime and drug abuse.

Environmental Consequences:

- **Overcrowding** of people due to rural-urban migration has put pressure on the **existing social and physical infrastructure** in the urban areas.
- It leads to **unplanned growth of urban settlement** and formation of slums shanty colonies.
- Due to over-exploitation of natural resources, cities are facing the acute problem of depletion of ground water, air pollution, disposal of sewage and management of solid wastes.

Other Consequences:

- Migration (even excluding the marriage migration) affects the status of women directly or indirectly.
- In the rural areas, male selective out migration leaving their wives behind puts extra physical as well mental pressure on the women.
- Migration of 'women' either for education or employment enhances their autonomy and role in the economy.

3

Human Development

Human development is a process of enlarging the range of people's choices, increasing their opportunities for education, health care, income and empowerment and covering the full range of human choices from a sound physical environment to economic, social and political freedom.

Aspects of Development:

- In the present context, computerisation, industrialisation, efficient transport and communication network, large education system and security of individuals, etc. are considered as the symbols of development.
- Every individual, community and government measure its performance or levels of development in relation to the availability and access to some of these things. But this may be partial and one-sided view of development. It is often called the **western or euro-centric view of development**.

Development in India:

- The **development is a mixed bag of opportunities as well as neglect and deprivations**.
 - There are a few areas like the metropolitan centres that have all the modern facilities available to a small section of its population.
 - At the other extreme of it, there are large slums in the urban areas that do not have basic amenities like potable water, education, and health infrastructure etc.
- Distribution of development is more alarming when it comes to distribution of development between various sections

like scheduled castes, scheduled tribes, landless agricultural labourers, poor farmers, and slums dwellers, etc.

- The poor are being subjected to three inter-related processes of declining capabilities, i.e.
 - **Social Capabilities:** Due to displacement and weakening social ties (social capital),
 - **Environmental Capabilities:** Due to pollution.
 - **Personal Capabilities:** Due to increasing incidence of diseases and accidents.
- The present development has not been able to address the issues of social injustice, regional imbalances, and environmental degradation.

It was thought to take up human development as a separate issue against the prevalent western views of development.

- Most systematic effort towards this was the publication of the First **Human Development Report** by United Nations Development Programme (UNDP) in **1990**.
- According to the Human Development Report 1993, "**progressive democratisation** and **increasing empowerment** of people are seen as the minimum conditions for human development".

Human Development in India:

- India's ranking in Human Development Index (HDI) is 129 out of 189 countries in 2019 HDI report.
- India's HDI score is 0.645 (medium category).
- There is 50% increase in HDI value of India from 1990 level.

Aspects not covered while calculating HDI: (Criticism of HDI)

- **Historical Factors:** Like Colonisation, imperialism and neo-imperialism.
- **Socio-Cultural Factors:** Like human rights violation.
- **Social Discrimination:** It is based on race, religion, gender and caste.
- **Social Problems:** Like crimes, terrorism, and war.
- **Political Factors:** Like nature of the state, forms of the government (democracy or dictatorship) level of empowerment. These are some factors that are very crucial in determining the nature of human development. These aspects have special significance in case of India.
- The Planning Commission of India also prepared the Human Development Report for India using the indicators selected by the UNDP.
- Subsequently, each state government also started preparing the state level Human Development Reports, using districts as the units of analysis.
- The planning commission's report also discussed other indicators like economic attainment, social empowerment, social distributive justice, accessibility, hygiene, etc.

Indicators for Economic Attainments:

- Rich resource base and access to these resources is the key to productivity, well-being, and human development.
- **Gross National Product (GNP)** and its per capita availability are taken as measures to assess the resource base/endowment of any country.
- Economic attainment and the well-being of individuals depend on economic

growth, employment opportunities and access to assets.

- Over the years the per capita income and consumption expenditure in India has increased.
- The percentage of persons **below the poverty line** in **2011-12** has been estimated as **25.7% in rural areas, 13.7% in urban areas** and **21.9% for the country as a whole**.

Poverty:

Poverty is a state of deprivation. In absolute terms it reflects the inability of an individual to satisfy certain basic needs for a sustained, healthy, and reasonably productive living.

- The Gross Domestic Product (GDP) of a country does not fully reflect the quality of life of a country. There are other factors like housing, access to public transport, air, quality and access to drinking water which also determine the standard of living.
- Jobless growth and rampant unemployment are some of the important reasons for higher

Indicators of a Healthy Life:

Life free from illness and ailment and living a reasonably long-life span are indicative of a healthy life.

- **Availability of pre and post-natal healthcare facilities** in order to reduce infant mortality and post-delivery deaths among mothers.

- Old age health care, adequate nutrition and safety of individual are some important measures of a healthy and reasonably long life.
- India has done reasonably well in some of the health indicators like **decline in death rate from 25.1 per thousand in 1951 to 6.5 per thousand in 2015** and infant mortality from 148 per thousand to 37 during the same period.
- India has recorded declining female sex ratio.

Indicators of Social Empowerment:

- **“Development is freedom”:** Freedom from hunger, poverty, servitude, bondage, ignorance, illiteracy, and any other forms of domination.
- Freedom in real sense is possible only with the empowerment and participation of the people in the exercise of their capabilities and choices in the society.
- Literacy is the beginning of access to such a world of knowledge and freedom.
- Overall **literacy in India** is approximately **74.04 per cent (2011)** while female literacy is 65.46 per cent.
- **Total literacy** as well as **female literacy is higher** than the national average in most of the states from **south India**.
- **Wide regional disparities in Literacy Rate:**
 - State like Bihar has very low (63.82 per cent) literacy.
 - States like Kerala and Mizoram have literacy rates of 93.91 and 91.58 % respectively.
- **Percentage of literates in the rural areas and among the marginalised sections of our society** such as females, scheduled

castes, scheduled tribes, agricultural labourers, etc. **is very low.**

- The gap between the richer and the marginalised sections of the population has increased over the years.

Human Development Index in India:

- **Kerala is at top with the composite index value of 0.790** and is followed by Delhi, Himachal Pradesh, Goa and Punjab.
 - **Kerala record the highest value in the HDI** largely due to its impressive performance in achieving near hundred per cent literacy.
- The states like Bihar, Odisha and Chhattisgarh are at the bottom among the 23 major states.
- **Economically developed states** like Maharashtra, Tamil Nadu and Punjab and Haryana have **higher value of HDI** as compared to states like Chhattisgarh, Bihar, Madhya Pradesh, etc.
- Regional distortions and social disparities which developed during the colonial period continue to play an important role in the Indian economy, polity, and society.

Population, Environment and Development:

Development in general and human development in particular is a complex concept used in social sciences.

- It is complex because for ages it was thought that development is a substantive concept and once it is achieved it will address all the socio-cultural and environmental ills of the society.
- Though, development has brought in significant improvement in the quality

of life but increasing regional disparities, social inequalities, discriminations, and undermining human values and environmental degradation have also increased.

- In its **1993** report, UNDP tried to amend some of the implicit biases and prejudices which were entrenched in concept of development.
 - **People's participation and their security** were the **major issues in the Human Development Report of 1993.**
 - Recognised greater constructive role of 'Civil Societies' in bringing about peace and human development.

Development and Environment:

Views expressed by the Neo-Malthusians, environmentalists, and radical ecologists.

- They **believe that for a happy and peaceful social life proper balance between population and resources is a necessary condition.**
- According to these thinkers, **the gap between the resources and population has widened after eighteenth century.**
- Development has only contributed to increasing the multiple uses of the limited resources and it led to enormous increase in the demand of these resources.
- Sir **Robert Malthus** was the first one to voice his **concern about the growing scarcity of resources as compared to the human population.**
- Unending pursuit for the control of more and more resources by the powerful and use of the same for exhibiting one's prowess is the prime cause of conflicts

as well as the apparent contradictions between population-resource and development.

Evolution of Sustainable Resource use in India:

- Indian culture and civilisation have been very sensitive to the issues of population, resource, and development for a long time.
 - The ancient scriptures were essentially concerned about the balance and harmony among the elements of nature.
- **Mahatma Gandhi** in the recent times advocated the reinforcement of the harmony and balance between the development and environment.
 - He was quite apprehensive about the on-going development particularly the way industrialisation has institutionalised the loss of morality, spirituality, self-reliance, nonviolence and mutual co-operation and environment.
- Gandhi's views were also re-echoed in the **Club of Rome Report "Limits to Growth"** (1972), Schumacher's book "Small is Beautiful" (1974), **Brundtland Commission's** Report "**Our Common Future**" (1987) and finally in the "Agenda-21 Report of the Rio Conference" (1993).

Interesting Points:

- **Swachh Bharat Mission:**
 - The release of toxic and non-biodegradable wastes from industries and urban sewerages, and open defecation, etc, have created many health hazards. The



Government of India has initiated many steps to address these problems and the Swachh Bharat Mission is one of these.

- **Major Source of Pollution in Urban India:** Municipal waste, industrial effluents and pollutants generated by transport, etc.
- Open defecation in rural areas and in urban slums are a major source of pollution.
- It aims at a **pollution-free environment** with following objectives:
 - ◆ Making India open defecation-free and achieving 100 per

cent scientific management of municipal solid waste, construction of individual household latrines (IHHL), community toilet (CT) seats and public toilet (PT) seats.

- ◆ Making provisions for the supply of clean energy fuel LPG to all households in rural India to reduce domestic pollution.
- ◆ Providing potable drinking water to every household to control the spread of water-borne diseases.
- ◆ Promoting the use of non-convention energy resources, like wind and solar energy.



Unit: II



4

Human Settlements

Human Settlement means cluster of dwellings of any type or size where human beings live. For this purpose, people may erect houses and other structures and command some area or territory as their economic support base. Thus, the process of settlement inherently involves grouping of people and apportioning of territory as their resource base.

Settlements:

With size, the economic character and social structure of settlements changes and so do its ecology and technology. Settlements could be small and sparsely spaced and they may also be large and closely spaced.

- The **sparsely located** small settlements are called **villages**, specialising in agriculture or other primary activities.
- There are fewer but **larger settlements** which are termed as **urban settlements** specialising in secondary and tertiary activities.

Basic differences between Rural and Urban Settlements:

- The rural settlements derive their **life support or basic economic needs** from land based primary economic activities whereas urban settlements depend on processing of raw materials and manufacturing of finished goods and a variety of services.
- **Cities act as nodes of economic growth**, provide goods and services not only to urban dwellers but also to the people of the rural settlements in their hinterlands in return for food and raw materials. This functional relationship between the

urban and rural settlements takes place through transport and communication network.

- Rural and urban settlements differ in terms of social relationship, attitude, and outlook.
 - **Rural people are less mobile** and therefore, social relations among them are intimate.
 - In **urban areas, the way of life is complex and fast**, and social relations are formal.

Rural Settlements:

They are determined by the extent of the built-up area and inter-house distance.

- In India compact or clustered village of a few hundred houses is a rather universal feature, particularly in the northern plains.
- There are various factors and conditions responsible for having different types of rural settlements in India. These include:
 - **Physical Factors** – nature of terrain, altitude, climate, and availability of water.
 - **Cultural and Ethnic Factors** – social structure, caste, and religion.
 - **Security Factors** – defence against thefts and robberies.

Types of Rural Settlements in India

Clustered Settlement:

- The clustered rural settlement is a compact or **closely built-up area of houses**.
- In this type of village, the general living area is distinct and separated from the surrounding farms, barns and pastures.
- The **closely built-up area and its intervening streets present some**

recognisable pattern or geometric shape, such as rectangular, radial, linear, etc.

- Such settlements are generally found in **fertile alluvial plains** and in the **north-eastern states**.
- Sometimes, people live in compact village for security or defence reasons, such as in the Bundelkhand region of central India and in Nagaland.
- In Rajasthan, scarcity of water has necessitated compact settlement for maximum utilisation of available water resources.

Semi - Clustered Settlement:

- Semi-clustered or **fragmented settlements** may result from tendency of clustering in a **restricted area of dispersed settlement**.
- Such a pattern may also result from segregation or fragmentation of a large compact village. In this case, one or more sections of the village society choose or is forced to live a little away from the main cluster or village.
- In such cases, generally, **the land-owning and dominant community occupies the central part of the main village**, whereas people of lower strata of society and menial workers settle on the outer flanks of the village.
- Such settlements are widespread in the **Gujarat plain** and some parts of **Rajasthan**.

Hamleted Settlement:

- Sometimes settlement is **fragmented into several units physically separated from each other** bearing a common name. These units are locally called

panna, para, palli, nagla, dhani, etc. in various parts of the country.

- The segmentation of a large village is often motivated by social and ethnic factors.
- Such villages are more frequently found in the **middle and lower Ganga plain, Chhattisgarh and lower valleys of the Himalayas**.

Dispersed Settlement:

- Dispersed or **isolated settlement** pattern appears in the form of **isolated huts** or hamlets of few huts in remote jungles, or on small hills with farms or pasture on the slopes.
- Extreme dispersion of settlement is often caused by extremely fragmented nature of the terrain and land resource base of habitable areas.
- This settlement is found in many areas of Meghalaya, Uttarakhand, Himachal Pradesh and Kerala.

Urban Settlement:

- Unlike rural settlements, **urban settlements are generally compact and larger in size**.
- They are **engaged in a variety of non-agricultural, economic and administrative functions**.
- An exchange of goods and services is performed sometimes directly and sometimes through a series of market towns and cities. Thus, cities are connected directly as well as indirectly with the villages and also with each other.

Evolutions of Towns in India:

Towns flourished since prehistoric times in India. Even at the time of **Indus**

valley civilisation, towns like **Harappa** and **Mohenjo-Daro** were in existence. It continued with periodic ups and downs until the arrival of Europeans in India in the eighteenth century.

Classification of Towns based on their Evolution in Different Periods

Ancient Towns:

- There are number of towns in India having historical background spanning over 2000 years.
- **Most of them developed as religious and cultural centres.** **Varanasi** is one of the important towns among these. Prayag (Allahabad), Pataliputra (Patna), Madurai are some other examples of ancient towns in the country.

Medieval Towns:

- About 100 of the existing towns have their roots in the medieval period.
- **Most of them developed as headquarters of principalities and kingdoms.** These are fort towns which came up on the ruins of ancient towns. Important among them are Delhi, Hyderabad, Jaipur, Lucknow, Agra, and Nagpur.

Modern Towns:

- The **British and other Europeans have developed a number of towns in India.** Starting their foothold on coastal locations, they first developed some trading ports such as Surat, Daman, Goa, Pondicherry, etc.
- The British later consolidated their hold around three **principal nodes** – Mumbai (Bombay), Chennai (Madras), and Kolkata (Calcutta) – and built them in the British style.

- Rapidly extending their domination either directly or through control over the princely states, they established their administrative centres, hill towns as summer resorts, and added new civil, administrative, and military areas to them. Towns based on modern industries also evolved after 1850. Jamshedpur can be cited as an example.

- **After Independence: A large number of towns have been developed as administrative headquarters,** e.g., Chandigarh, Bhubaneswar, Gandhinagar, Dispur, etc., and industrial centres, such as Durgapur, Bhilai, Sindri, Barauni.
- Some old towns also developed as satellite towns around metropolitan cities, such as Ghaziabad, Rohtak, Gurugram around Delhi.
- With increasing investment in rural areas, a large number of medium and small towns have developed all over the country.

Urbanisation in India:

- The level of urbanisation is measured in terms of percentage of urban population to total population. The **level of urbanisation** in India in 2011 was **31.16 per cent**, which is quite low in comparison to developed countries.
- Enlargement of urban centres and emergence of new towns have played a significant role in the growth of urban population and urbanisation in India.

Classification of Towns base on Population Size:

- Urban centre with population of **more than one lakh** is called a **city or class I town**.

- Cities accommodating population size between **one to five million** are called **metropolitan cities**.
 - **More than five million are mega cities.**
 - Majority of metropolitan and mega cities are urban agglomerations.
 - An urban agglomeration may consist of any one of the following three combinations:
 - A town and its adjoining urban outgrowths.
 - Two or more contiguous towns with or without their outgrowths.
 - A city and one or more adjoining towns with their outgrowths together forming a contiguous spread.
- Population in Urban Areas:**
- **More than 60 per cent of urban population in India lives in Class I towns.**
 - Out of 468 cities, 53 cities/ urban agglomerations are metropolitan cities. Six of them are mega cities with population over five million each.
 - More than one-fifth (21.0%) of urban population lives in these mega cities.
 - **Greater Mumbai** is the **largest agglomeration** with 18.4 million people. Delhi, Kolkata, Chennai, Bengaluru, and Hyderabad are other mega cities in the country.

Table 4.1: India — Class-wise number of towns and cities and their population, 2011

Class	Population Size	Number of cities	Total Urban Population (in thousand)	% of total population
I	1,00,000 and more	468	2,27,899	60.45
II	50,000–99,999	474	41,328	10.96
III	20,000–49,999	1,373	58,174	15.43
IV	10,000–19,999	1,683	31,866	8.45
V	5,000–9,999	1,749	15,883	4.21
VI	Less than 5,000	424	1,956	0.51

Functional Classification of Town:

Many towns and cities perform specialised services. Some towns and cities specialise in certain functions and they are known for some specific activities, products, or services. On the basis of dominant or specialised functions, Indian cities and towns can be broadly classified as follows:

- **Administrative Towns and Cities:** Towns supporting administrative headquarters of higher order are administrative towns, such as Chandigarh, New Delhi, Bhopal, Shillong, Guwahati, Imphal, Srinagar, Gandhinagar, Jaipur, Chennai, etc.
- **Industrial Towns:** Industries constitute prime motive force of these cities, such as Mumbai, Salem, Coimbatore, Modinagar, Jamshedpur, Hugli, Bhilai, etc.
- **Transport Cities:** They may be ports primarily engaged in export and import activities such as Kandla, Kochchi, Kozhikode, Vishakhapatnam, etc., or hubs of inland transport, such as Agra, Dhulia, Mughalsarai, Itarsi, Katni, etc.
- **Commercial Towns:** Towns and cities specialising in trade and commerce are kept in this class. Kolkata, Saharanpur, Satna, etc., are some examples.
- **Mining Towns:** These towns have developed in mineral rich areas such as Raniganj, Jharia, Digboi, Ankaleshwar, Singrauli, etc.
- **Garrison Cantonment Towns:** These towns emerged as garrison towns such as Ambala, Jalandhar, Mhow, Babina, Udampur, etc.
- **Educational Towns:** Starting as centres of education, some of the towns have

grown into major campus towns, such as Roorki, Varanasi, Aligarh, Pilani, Allahabad, etc.

- **Religious and Cultural Towns:** Varanasi, Mathura, Amritsar, Madurai, Puri, Ajmer, Pushkar, Tirupati, Kurukshetra, Haridwar, Ujjain came to prominence due to their religious/cultural significance.
- **Tourist Towns:** Nainital, Mussoorie, Shimla, Pachmarhi, Jodhpur, Jaisalmer, Udagamandalam (Ooty), Mount Abu are some of the tourist destinations. The cities are not static in their function. The functions change due to their dynamic nature. Even specialised cities, as they grow into metropolises become multifunctional wherein industry, business, administration, transport, etc., become important.

Interesting Points:

- **Smart Cities Mission:**
 - **Objective:** To promote cities that provide core infrastructure, a clean and sustainable environment and give a decent quality of life to its citizens.
 - One of the features of Smart Cities is to apply smart solutions to infrastructure and services in order to make them better. For example, making areas less vulnerable to disasters, using fewer resources, and providing cheaper services.
 - The focus is on sustainable and inclusive development and the idea is to look at compact areas, create a replicable model, which will act like a lighthouse to other aspiring cities.



Unit: III

5

Land Resources and Agriculture

The land is put to different uses. Some land is occupied by rivers, some may have trees and, on some parts roads, and buildings have been built. Different types of lands are suited to different uses. Human beings use land as a resource for production as well as residence and recreation.

Land Use:

- **Land-use records** are maintained by **land revenue department**.
- The land use categories add up to **reporting area**, which is somewhat different from the geographical area.
- The **Survey of India** is responsible for measuring **geographical area** of administrative units in India.
- The difference between the two concepts is that while the former changes somewhat depending on the estimates of the land revenue records, the latter does not change and stays fixed as per Survey of India measurements.

The land-use categories as maintained in the Land Revenue Records are as follows:

- **Forests:** It is important to note that area under **actual forest cover** is **different from area classified as forest**.
 - The latter is the area which the Government has identified and demarcated for forest growth.
 - The land revenue records are consistent with the latter definition.
 - Thus, there may be an increase in this category without any increase in the actual forest cover.
- **Barren and Wastelands:** The land which may be classified as a wasteland such

as barren hilly terrains, desert lands, ravines, etc. normally cannot be brought under cultivation with the available technology.

- **Land put to Non-agricultural Uses:** Land under settlements (rural and urban), infrastructure (roads, canals, etc.), industries, shops, etc., are included in this category. An expansion in the secondary and tertiary activities would lead to an increase in this category of land-use.
- **Area under Permanent Pastures and Grazing Lands:** Most of this type of land is owned by the village 'Panchayat' or the Government. Only a small proportion of this land is privately owned. The land owned by the village panchayat comes under 'Common Property Resources'.
- **Area under Miscellaneous Tree Crops and Groves (Not included in Net sown Area):** The land under orchards and fruit trees are included in this category. Much of this land is privately owned.
- **Culturable Wasteland:** Any land which is left fallow (uncultivated) for more than five years is included in this category. It can be brought under cultivation after improving it through reclamation practices.
- **Current Fallow:** This is the land which is left without cultivation for one or less than one agricultural year. Following is a cultural practice adopted for giving the land rest. The land recoups the lost fertility through natural processes.
- **Fallow other than Current Fallow:** This is also a cultivable land which is left uncultivated for more than a year but less than five years. If the land is left uncultivated for more than five years,

it would be categorised as culturable wasteland.

- **Net Area Sown:** The physical extent of land on which crops are sown and harvested is known as net sown area.

Land-Use Changes in India:

Land-use in a region, to a large extent, is influenced by the nature of economic activities carried out in that region. However, while economic activities change over time, land, like many other natural resources, is fixed in terms of its area. At this stage, one needs to appreciate **three types of changes** that an economy undergoes, which affect land-use.

- **The size of the economy** (measured in terms of value for all the goods and services produced in the economy) grows over time as a result of increasing population, change in income levels, available technology, and associated factors.
 - As a result, **the pressure on land will increase with time** and marginal lands would come under use.
- The **composition of the economy** would undergo a change over time. The **secondary and the tertiary sectors usually grow much faster than the primary sector**, specifically the agricultural sector. This type of change is common in developing countries, like India.
 - This process would result in a gradual shift of land from agricultural uses to non-agricultural uses.
- Though the contribution of the **agricultural activities reduces over time**, the pressure on land for agricultural

activities does not decline. The reasons for continued **pressure on agricultural land are:**

- In developing countries, the share of population dependent on agriculture usually declines much more slowly compared to the decline in the sector's share in GDP.
- The number of people that the agricultural sector has to feed is increasing day by day.

India has undergone major changes within the economy over the past four or five decades, and this has influenced the land-use changes in the country. Share of area under forest, area under non-agricultural uses, current fallow lands, and net area sown have shown an increase. The following observations can be made about these increases:

- The **rate of increase** is the **highest** in case of area under **non-agricultural uses**.
 - This is due to the changing structure of Indian economy, which is increasingly depending on the contribution from industrial and services sectors and expansion of related infrastructural facilities.
 - An expansion of area under both urban and rural settlements has added to the increase. Thus, the **area under non-agricultural uses** is increasing at the **expense of wastelands and agricultural land**.
- The **increase in the share under forest, accounted by increase in the demarcated area** under forest rather than an actual increase in the forest cover in the country.

- The trend of current fallow fluctuates a great deal over years, depending on the variability of rainfall and cropping cycles.
- The **increase in net area sown** is a recent phenomenon due to use of culturable waste land for agricultural purpose. Before which it was registering a slow decrease.
 - There are indications that most of the decline had occurred due to the increases in area under non-agricultural use.

The four categories that have registered a decline are barren and wasteland, culturable wasteland, area under pastures and tree crops and fallow lands. Reasons behind decline are:

- As the pressure on land increased, the wastelands and culturable wastelands have witnessed decline over time.
- The decline in land under pastures and grazing lands can be explained by pressure from agricultural land. Illegal encroachment due to expansion of cultivation on common pasture lands is largely responsible for this decline.

Common Property Resources: Land, according to its ownership can broadly be classified under two broad heads:

- **Private land:** It is owned by an individual or group of individuals.
- **Common property resources (CPRs):** This land is mean for use of the community. Such as Community forests, pasture lands, village water bodies etc. CPRs provide fodder for the livestock and fuel for the households along with other minor forest products like fruits, nuts, fibre, medicinal plants, etc.

- In rural areas, such land is of particular relevance for the livelihood of the landless and marginal farmers and other weaker sections since many of them depend on income from their livestock due to the fact that they have limited access to land.
- CPRs also are important for women as most of the fodder and fuel collection is done by them in rural areas.
- CPRs can be defined as community's natural resource, where every member has the right of access and usage with specified obligations, without anybody having property rights over them.

Agricultural Land Uses in India:

Land resource is more crucial to the livelihood of the people depending on agriculture:

- Agriculture is purely land based activity. The contribution of land in agricultural output is more compared to its contribution in the outputs in the other sectors. Thus, **lack of access to land** is directly **correlated** with **incidence of poverty** in rural areas.
- **Quality of land** has a direct bearing on the **productivity of agriculture**, which is not true for other activities.
- In rural areas, aside from its value as a productive factor, **land ownership has a social value** and serves as a security for credit, or life contingencies, and also adds to the social status.

An estimation of the total stock of agricultural land resources (i.e. total cultivable land) can be arrived at by adding up net sown area, all fallow lands and culturable wasteland.

- It may be observed that over the years, there has been a **marginal decline** in the available **total stock of cultivable land** as a percentage to total reporting area.
 - There has been a greater decline of cultivated land, in spite of a corresponding decline of cultivable wasteland.
 - The scope for bringing in additional land under net sown area in India is limited. There is, thus, an urgent need to evolve and **adopt land-saving technologies**.
- Such technologies can be classified under **two heads**:
- Those which raise the yield of any particular crop per unit area of land.
 - Those which increase the total output per unit area of land from all crops grown over one agricultural year by increasing land-use intensity.
- The **cropping intensity (CI)** is calculated as follows:
- $$\text{Cropping Intensity in percentage} = \frac{\text{GCA}}{\text{NSA}} \times 100$$

Table 5.1: Composition of Total Cultivable Land

Agricultural Land – use Categories	As a percentage of Reporting Area		As a percentage of total cultivable land	
	1950-51	2014-15	1950-51	2014-15
Culturable Waste land	8.0	4.0	13.4	6.8
Fallow other than Current Fallow	6.1	3.6	10.2	6.2
Current Fallow	3.7	4.9	6.2	8.4
Net Area Sown	41.7	45.5	70.0	78.4
Total Cultivable Land	59.5	58.0	100.00	100.00

**Cropping Seasons in India:**

There are three distinct crop seasons in the **northern** and **interior parts** of country.

- **Kharif Season:** It largely coincides with **Southwest Monsoon** under which the cultivation of tropical crops, such as rice, cotton, jute, jowar, bajra and tur is possible.
- **Rabi Season:** It begins with the **onset of winter** in October-November and ends in March-April. The low temperature conditions facilitate the cultivation of temperate and subtropical crops such as wheat, gram, and mustard.
- **Zaid Season:** It is a short duration summer cropping season **beginning after harvesting of rabi** crops. The cultivation of watermelons, cucumbers, vegetables, and fodder crops during this season is done on irrigated lands. This type of distinction in the cropping season does not **exist in southern parts**

of India. The temperature is high enough to grow tropical crops during any period in the year provided the soil moisture is available. Therefore, in this region **same crops** can be **grown thrice** in an agricultural year.

Types of Farming:

On the basis of main source of moisture for crops, the farming can be classified as **irrigated** and **rainfed (barani)**. There is difference in the nature of irrigated farming, as well as based on the objective of irrigation, i.e., **protective, or productive**.

- **Protective Irrigation:** It protect the crops from adverse effects of soil moisture deficiency. The strategy of this kind of irrigation is to provide **soil moisture to maximum possible area**.
- **Productive Irrigation:** It is meant to provide **sufficient soil moisture** in the cropping season to achieve high

Table 5.2: Cropping Seasons in India

Cropping Season	Major Crops Cultivated	
	Northern States	Southern States
Kharif June - September	Rice, Cotton, Bajra, Maize, Jowar, Tur	Rice, maize, Ragi, Jowar, Groundnut
Rabi October-March	Wheat, Gram, Rapeseeds and Mustard, Barley	Rice, Maize, Ragi, Groundnut, Jowar
Zaid April - June	Vegetables, Fruits, Fodder	Rice, Vegetables, Fodder

productivity. The water input per unit area of cultivated land is higher than protective irrigation.

Classification of Rainfed Farming based on adequacy of soil moisture during cropping season:

- **Dryland Farming:**
 - It is largely confined to the regions having **annual rainfall less than 75 cm**.
 - These regions grow hardy and **drought resistant crops** such as ragi, bajra, moong, gram and guar (fodder crops) and practise various measures of soil moisture conservation and rainwater harvesting.
- **Wetland Farming:**
 - The **rainfall is in excess of soil moisture** requirement of plants during rainy season. Such regions may face flood and soil erosion hazards.
 - These areas grow various **water intensive crops** such as rice, jute and sugarcane and practise aquaculture in the freshwater bodies.

Food Grains:

- These crops occupy about **two-third of total cropped area** in the country.
- Food grains are dominant crops in all parts of India whether they have subsistence or commercial agricultural economy.
- On the basis of the structure of grain the **food grains are classified** as **cereals** and **pulses**.

Cereals: They occupy **about 54 per cent** of total cropped area in India.

- India produces about 11 per cent cereals of the world and ranks third in production after China and U.S.A.

- India produces a variety of cereals, which are classified as **fine grains** (rice, wheat) and **coarse grains** (jowar, bajra, maize, ragi), etc.

Rice:

- Rice is a **staple food** for the overwhelming majority of population in India.
- Though, it is considered to be a crop of tropical humid areas, it has about 3,000 varieties which are grown in different Agro-climatic regions.
- These are successfully grown from sea level to about 2,000 m altitude and from humid areas in eastern India to dry but irrigated areas of Punjab, Haryana, western U.P. and northern Rajasthan.
- In southern states and West Bengal, the climatic conditions allow the cultivation of two or three crops of rice in an agricultural year.
- In **West Bengal farmers** grow three crops of **rice** called '**aus**', '**aman**' and '**boro**'.
- In Himalayas and North-Western parts of India, it is grown as a kharif crop during southwest Monsoon season.
- **India contributes 21.6 per cent of rice production in the world and ranked second after China in 2016.** About one-fourth of the total cropped area in the country is under rice cultivation. West Bengal, Uttar Pradesh, and Punjab are the leading rice producing states in the country.
- The yield level of rice is high in Punjab, Tamil Nadu, Haryana, Andhra Pradesh, Telangana, West Bengal, and Kerala.
- In the first four of these states almost the entire land under rice cultivation is irrigated. Punjab and Haryana are not traditional rice growing areas.

- **Rice cultivation in the irrigated areas of Punjab and Haryana was introduced in 1970s** following the Green Revolution. Genetically improved varieties of seed, relatively high usage of fertilizers and pesticides and lower levels of susceptibility of the crop to pests due to dry climatic conditions are responsible for higher yield of rice in this region. The yield of this crop is very low in rainfed areas of Madhya Pradesh, Chhattisgarh, and Odisha.

Wheat:

- Wheat is the **second most important cereal crop** in India after rice.
- India has **maximum area under wheat cultivation** in world.
- It is primarily a **crop of temperate zone**. Hence, its cultivation in India is done during winter i.e., **rabi season**.
- **Concentration of Crop:** About 85 per cent of total area is concentrated in north and central regions of India i.e., Indo Gangetic Plain, Malwa Plateau and Himalayas up to 2,700 m altitude.
- It is mostly grown under irrigated conditions as it is a rabi crop. But it is a **rainfed crop** in Himalayan highlands and parts of Malwa plateau in Madhya Pradesh.
- **About 14 per cent of the total cropped area in India is under wheat cultivation.**
- **Leading Wheat Producing States:** Uttar Pradesh, Madhya Pradesh, Punjab, Haryana and Rajasthan.
- The yield level of wheat is very high (above 4,000 k.g. per ha) in Punjab and Haryana whereas, Uttar Pradesh, Rajasthan and Bihar have moderate yields.
- The states like Madhya Pradesh, Himachal Pradesh and Jammu and Kashmir growing wheat under rainfed conditions have low yield.

Jowar:

- The coarse cereals together occupy about 16.50 per cent of total cropped area in India. Among these, **jowar** or **sorghum** alone accounts for about **5.3 per cent of total cropped area**.
- It is main food crop in **semi-arid areas** of central and southern India.
- **Maharashtra** alone produces **more than half of the total jowar** production of India. Other leading producer states are Karnataka, Madhya Pradesh, Andhra Pradesh, and Telangana.
- It is sown in both **kharif and rabi seasons** in **southern states**.
- It is a **kharif crop** in **northern India** where it is mostly grown as a fodder crop. South of Vindhyaclal it is a rainfed crop and its yield level is very low in this region.

Bajra:

- Bajra is sown in **hot and dry climatic conditions** in northwestern and western parts of India.
- It is a **hardy crop** which **resists frequent dry spells** and **drought** in this region.
- It is cultivated alone as well as part of mixed cropping.
- This coarse cereal occupies about **5.2 per cent of total cropped area** in the country.
- **Leading Producers of Bajra:** Maharashtra, Gujarat, Uttar Pradesh, Rajasthan, and Haryana.

- Being a **rainfed crop**, the yield level of this crop is **low in Rajasthan** and fluctuates a lot from year to year.
- Yield of this crop has increased during recent years in Haryana and Gujarat due to introduction of drought resistant varieties and expansion of irrigation under it.

Maize:

- Maize is a food as well as fodder crop grown under **semi-arid climatic conditions** and over inferior soils. This crop occupies only about **3.6 per cent** of total cropped area.
- Maize cultivation is **not concentrated in any specific region**. It is **sown all over India** except Punjab and eastern and North-Eastern regions.
- **Leading Producers of Maize:** Karnataka, Madhya Pradesh, Bihar, Andhra Pradesh, Telangana, Rajasthan, and Uttar Pradesh.
- Yield level of maize is higher than other coarse cereals. It is high in southern states and declines towards central parts.

Pulses:

- Pulses are a very important ingredient of vegetarian food as these are **rich sources of proteins**.
- These are legume crops which increase the natural fertility of soils through nitrogen fixation.
- India is a leading producer of pulses in the world.
- The cultivation of pulses in India is largely concentrated in the **drylands** of Deccan and central plateaus and northwestern parts of the country.

- Pulses occupy about **11 per cent** of the total cropped area in the country.
- Being the **rainfed crops of drylands**, the yields of pulses are low and fluctuate from year to year.
- **Gram and tur are the main pulses** cultivated in India.

Gram:

- Gram is cultivated in **subtropical areas**.
- It is mostly a **rainfed crop** cultivated during **rabi season** in central, western and NorthWestern parts of India.
- Just one or two light showers or irrigations are required to grow this crop successfully.
- It has been displaced from the cropping pattern by wheat in Haryana, Punjab and northern Rajasthan following the green revolution.
- Gram covers only about 2.8 per cent of the total cropped area in the country.
- **Main Producers:** Madhya Pradesh, Uttar Pradesh, Maharashtra, Andhra Pradesh, Telangana, and Rajasthan.
- The yield of this crop continues to be low and fluctuates from year to year even in irrigated areas.

Tur (Arhar):

- Tur is the **second important pulse crop** in India and is also known as **red gram or pigeon pea**.
- It is cultivated over marginal lands and under rainfed conditions in the dry areas of central and southern states of India.
- It occupies only about 2 per cent of total cropped area of India.
- **Maharashtra** alone contributes about **one-third** of the total production of tur.

- **Other Leading Producers:** Uttar Pradesh, Karnataka, Gujarat, and Madhya Pradesh.
- Per hectare output of this crop is very low and its performance is inconsistent.

Oilseeds:

- The oilseeds are produced for **extracting edible oils**.
- **Oilseeds Growing Regions:** Drylands of Malwa plateau, Marathwada, Gujarat, Rajasthan, Telangana, Rayalaseema region of Andhra Pradesh and Karnataka plateau.
- These crops together occupy about 14 per cent of total cropped area in India.
- **Main oilseeds crops grown in India:** Groundnut, rapeseed, and mustard, soyabean and sunflower.

Groundnut:

- India produces about **16.6 per cent** of the total groundnut production in the world (2016).
- It is largely a **rainfed kharif** crop of drylands. But in **southern India**, it is also cultivated **during rabi season**.
- It covers about 3.6 per cent of total cropped area in the country.
- **Leading Producers:** Gujarat, Rajasthan, Tamil Nadu, Telangana, Andhra Pradesh, Karnataka, and Maharashtra.
- The yield of groundnut is comparatively high in Tamil Nadu where it is partly irrigated. But its yield is low in Telangana, Andhra Pradesh, and Karnataka.

Rapeseed and Mustard:

- Rapeseed and mustard comprise several oilseeds as **rai, sarson, toria** and **taramira**.

- These are **subtropical crops** cultivated during **rabi season** in north-western and central parts of India.
- These are frost sensitive crops and their yields fluctuate from year to year. But with the expansion of irrigation and improvement in seed technology, their yields have improved and stabilised to some extent.
- About two-third of the cultivated area under these crops is irrigated.
- These oilseeds together occupy only about **2.5 per cent of total cropped area** in the country.
- **Leading Producers:** Rajasthan contributes about one-third production while other leading producers are Haryana and Madhya Pradesh.
- Yields of these crops are comparatively high in Haryana and Rajasthan.

Other Oilseeds:

- Soyabean and sunflower are other important oilseeds grown in India.
- **Soyabean:**
 - It is mostly grown in **Madhya Pradesh** and **Maharashtra**. These two states together produce about 90 per cent of total output of soyabean in the country.
- **Sunflower:**
 - Its cultivation is concentrated in Karnataka, Andhra Pradesh, Telangana and adjoining areas of Maharashtra.
 - It is a **minor crop in Northern parts of India** where its yield is high due to irrigation.

Fiber Crops:

These crops provide us fibre for preparing cloth, bags, sacks and a number of other

items. Cotton and jute are two main fibre crops grown in India.

Cotton:

- Cotton is a **tropical crop** grown in **kharif season** in **semi-arid areas** of the country.
- India grows **short staple (Indian)** cotton and **long staple (American)** cotton called '**narma**' in north-western parts of India.
- Cotton requires clear sky during flowering stage.
- **India ranks second** in the world in the production of cotton after China.
- **Cotton Growing areas in India:**
 - Parts of Punjab, Haryana and northern Rajasthan in north-west.
 - Gujarat and Maharashtra in the west.
 - Plateaus of Andhra Pradesh, Karnataka and Tamil Nadu in south.
- **Leading Producers:** Gujarat, Maharashtra and Telangana .
- Per hectare output of cotton is high under irrigated conditions in north-western region of India.
- Its yield is very low in Maharashtra where it is grown under rainfed conditions.

Jute:

- Jute is used for making coarse cloth, bags, sacks, and decorative items.
- It is a **cash crop** in **West Bengal** and adjoining eastern parts of India.
- At present, India produces about **three-fifth of jute** production of the world.
- West Bengal accounts for about three-fourth of the production in the country.
- Bihar and Assam are other jute growing areas.
- This crop accounts for only about **0.5 per cent of total cropped area** in India.

Other Crops: Sugarcane, tea and coffee are other important crops grown in India.

Sugarcane:

- Sugarcane is a crop of **tropical areas**. Under rainfed conditions, it is cultivated in sub-humid and humid climates. But it is largely an irrigated crop in India.
- In **Indo-Gangetic plain**, its cultivation is largely concentrated in **Uttar Pradesh**.
- Sugarcane growing area in **western India** is spread over Maharashtra and Gujarat.
- In **southern India**, it is cultivated in irrigated tracts of Karnataka, Tamil Nadu, Telangana, and Andhra Pradesh.
- It accounts for about **19 per cent of the world production** of sugarcane. But it occupies only **2.4 per cent** of total cropped area in the country.
- **Uttar Pradesh** produces about **two-fifth of sugarcane** of the country.
- Maharashtra, Karnataka, Tamil Nadu, and Andhra Pradesh are other leading producers of this crop where yield level of sugarcane is high.
- Its yield is low in northern India.

Tea:

- Tea is a plantation crop used as **beverage**.
- **Black tea leaves** are **fermented** whereas **green tea leaves** are **unfermented**.
- Tea leaves have rich content of caffeine and tannin.
- It is an **indigenous** crop of hills in northern **China**.
- **Conditions:** It is grown over undulating topography of hilly areas and well

drained soils in humid and sub-humid tropics and sub-tropics.

- In **India**:
 - Tea plantation started in **1840s** in **Brahmaputra valley of Assam** which still is a major tea growing area in the country.
 - Later on, its plantation was introduced in the sub-Himalayan region of West Bengal (Darjeeling, Jalpaiguri and Cooch Behar districts).
 - Tea is also cultivated on the lower slopes of Nilgiri and Cardamom hills in Western Ghats.
- India is a **leading producer of tea** and accounts for about **21.1 per cent** of total production in the world 2016.
- India's share in the international market of tea has declined substantially. It ranks second among tea exporting countries in the world after China (2016).
- **Assam** accounts for about **53.2 per cent** of the total cropped area and contributes more than half of total production of tea in the country. West Bengal and Tamil Nadu are the other leading producers of tea.

Coffee:

- Coffee is a **tropical plantation** crop.
- Its seeds are roasted, ground and are used for preparing a beverage.
- There are three varieties of coffee i.e. **arabica, robusta and liberica**.
- **India** mostly grows superior quality coffee, **arabica**, which is in great demand in International market.
- India produces only **about 3.7 per cent** coffee of the world and ranks seventh after Brazil, Vietnam, Colombia, Indonesia, Ethiopia, and Honduras in 2016.

- **Cultivated Areas:** Coffee is cultivated in the highlands of Western Ghats in Karnataka, Kerala, and Tamil Nadu. Karnataka alone accounts for more than two-third of total production of coffee in India.

Agriculture Development in India Before Independence:

- Indian agricultural economy was **largely subsistence** in nature. It had dismal performance in the first half of twentieth century.
- This **period witnessed severe droughts and famines**.

During Partition:

- About one-third of the irrigated land in undivided India went to Pakistan. This reduced the proportion of irrigated area in Independent India.

After Independence:

- The **immediate goal** of the Government was to **increase food grains production** by, switching over from cash crops to food crops; intensification of cropping over already cultivated land; and increasing cultivated area by bringing cultivable and fallow land under plough.
- Initially, this strategy helped in increasing food grains production. But agricultural production stagnated during late -1950s.
 - To overcome this problem, **Intensive Agricultural District Programme (IADP)** and **Intensive Agricultural Area Programme (IAAP)** were launched.
- But two consecutive droughts during mid-1960s resulted in food crisis in India.

- Consequently, food grains were imported from other countries.
 - New seed varieties of wheat (Mexico) and rice (Philippines) known as **high yielding varieties** (HYVs) were available for cultivation by mid-1960s.
 - India took advantage of this and introduced package technology comprising HYVs, along with chemical fertilisers in irrigated areas of Punjab, Haryana, Western Uttar Pradesh, Andhra Pradesh, and Gujarat.
 - Assured supply of soil moisture through irrigation was a basic pre-requisite for the success of this new agricultural technology. This strategy of agricultural development paid dividends instantly and **increased the food grains production at very fast rate**. This spurt of agricultural growth came to be known as '**Green Revolution**'.
 - This also gave fillip to the development of a large number of Agro-inputs, Agro-processing industries, and small-scale industries.
 - This made the country **self-reliant in food grain** production.
 - But Green Revolution was initially confined to irrigated areas only.
 - This led to regional disparities in agricultural development in the country till 1970s, after which the technology spread to the Eastern and Central parts of India.
 - The **Planning Commission of India focused its attention on the problems of agriculture in rainfed areas in 1980s**.
 - It initiated Agro-climatic planning in 1988 to induce regionally balanced agricultural development in India.
 - It also emphasised on the need for diversification of agriculture and harnessing of resources for the development of dairy farming, poultry, horticulture, livestock rearing and aquaculture.
 - Initiation of the policy of liberalisation and free market economy in 1990s influenced the course of development of Indian agriculture.
- Growth of Agriculture Output and Technology:** There has been a significant increase in agricultural output and improvement in technology during the last 50 years.
- Production and yield of many crops such as rice and wheat has increased at an impressive rate. Among the other crops, the production of sugarcane, oilseeds and cotton has also increased appreciably.
 - **Expansion of Irrigation:**
 - It has played a crucial role in **enhancing agricultural output** in India.
 - It provided basis for introduction of modern agricultural technology, such as high yielding varieties of seeds, chemical fertilisers, pesticides, and farm machinery.
 - The net irrigated area in the country has also increased.
 - Modern agricultural technology has diffused very fast in various areas of the country.
 - Consumption of **chemical fertilizers** has **increased by 15 times** since mid-sixties.
 - Since the high yielding varieties are highly susceptible to pests and

diseases, the use of **pesticides** has **increased** significantly since 1960s.

Problems of Indian Agriculture:

It varies according to agro-ecological and historical experiences of its different regions. There are some problems which are common and range from physical constraints to institutional hindrances.

Dependence of Erratic Monsoon:

- Irrigation covers only about 33 per cent of the cultivated area in India. The crop production in rest of the cultivated land directly depends on rain.
 - **Poor performance of south-west monsoon** also adversely affects the supply of canal water for irrigation.
 - Even the areas receiving high annual rainfall experience considerable **fluctuations**.
- Drought is a common phenomenon in the low rainfall areas, which may also experience occasional floods. Droughts and floods continue to be the twin menace in Indian agriculture.

Low Productivity:

- The **yield** of the crops in the country is **low** in comparison to the international level.
 - **Per hectare output** of most of the crops such as rice, wheat, cotton, and oilseeds in India is **much lower** than that of the U.S.A., Russia, and Japan.
 - The vast rainfed areas of the country, particularly drylands which mostly grow coarse cereals, pulses and oilseeds have low yields.

- The labour productivity in Indian agriculture is very low because of the very high pressure on the land resources.

Constraints of Financial Resources and Indebtedness:

- The modern agriculture inputs are very expensive. This **resource intensive approach** has become **unmanageable** for marginal and small farmers as they have very meagre or no saving to invest in agriculture.
- To tide over these difficulties, most of such farmers have resorted to availing credit from various institutions and moneylenders.
- Crop failures and low returns from agriculture have forced them to fall in the **trap of indebtedness**.

Lack of Land Reforms:

- Indian peasantry had been exploited as there had been **unequal distribution of land**.
- Among the three **revenue systems** operational during British period, i.e., Mahalwari, Ryotwari and Zamindari, the **Zamindari** was **most exploitative** for the peasants.
- After Independence, land reforms were accorded priority, but these reforms were **not implemented effectively** due to lack of strong political will.

Small Farm Size and Fragmentation of Landholdings:

- There are a large number of marginal and small farmers and the **average size of land holding** is **shrinking** under increasing population pressure.

- There are some states where consolidation of holding has not been carried out even once.
- The small size fragmented landholdings are uneconomic.

Lack of Commercialisation:

- A large number of farmers produce crops for self-consumption and these farmers do not have enough land resources to produce more than their requirement.
- Modernisation and commercialisation of agriculture have taken place in the irrigated areas.

Vast Underemployment:

- There is a massive underemployment in the agricultural sector in India, particularly in the unirrigated tracts.
 - In these areas, there is a **seasonal unemployment** ranging from 4 to 8 months.
 - Even in the cropping season, work is not available throughout as agricultural operations are not labour intensive.

Degradation of Cultivable Land:

- The problem of degradation of land resources arises out of **faulty strategy of irrigation** and **agricultural development**. This may lead to depletion of soil fertility.
- The situation is particularly alarming in irrigated areas. A large tract of agricultural land has lost its fertility due to alkalisation and salinisation of soils and waterlogging.
- Excessive use of chemicals such as insecticides and pesticides has led to

their **concentration** in **toxic amounts** in the soil profile.

- Leguminous crops have been displaced from the cropping pattern in the irrigated areas and duration of fallow has substantially reduced owing to multiple cropping.
- Rainfed areas in humid and semi-arid tropics also experience degradation of several types like **soil erosion** by water and wind erosion which are often induced by human activities.

Interesting Points:

- **National Mission for Sustainable Agriculture (NMSA)**
 - It is to make agriculture more productive, sustainable, remunerative and climate resilient by promoting location specific integrated/composite farming systems and to conserve natural resources through appropriate soil and moisture conservation measures.
 - The Government has been promoting organic farming in the country through the scheme such as Paramparagat Krishi Vikas Yojana (PKVY) and Rastriya Vikas Yojana (RKVY).
- **Farmer's Portal of India:**
 - It gives detailed information on farmers' insurance, agriculture storage, crops, extension activities, seeds, pesticides, farm machineries, etc.
 - Block level details related to soil fertility, storage, insurance, training, etc. are available in an interactive map.

Water is a cyclic resource with abundant supplies on the globe. Approximately, 71 per cent of the earth's surface is covered with it but freshwater constitutes only about 3 per cent of the total water. In fact, a very small proportion of freshwater is effectively available for human use. The efficient use and conservation of water become necessary to ensure development.

Water Resources of India:

- **India** accounts for about **2.45 per cent** of the **world's surface area**, **4 per cent** of the **world's water resources** and about 16 per cent of the world's population.
- The total water available from **precipitation** in the country in a year is about **4,000 cubic km**.
- The availability from **surface water** and **replenishable groundwater** is **1,869 cubic km**.
 - Out of this, only 60 per cent can be put to beneficial uses.

Surface Water Resources:

- There are **four major sources of surface water** - rivers, lakes, ponds, and tanks.
- In India, there are about **10,360 rivers** and their tributaries longer than 1.6 km each.
- The mean annual flow in all the river basins in India is estimated to be 1,869 cubic km.
 - Due to topographical, hydrological, and other constraints, only about 690 cubic km (32 per cent) of the available surface water can be utilised.
- Water flow in a river depends on size of its catchment area or river basin and rainfall within its catchment area.

- The precipitation is relatively high in the catchment areas of the **Ganga, the Brahmaputra and the Barak rivers** and they account for only about one-third of the total area in the country, have **60 per cent** of the total surface water resources.

- Much of the annual water flow in south Indian rivers like the Godavari, the Krishna, and the Kaveri has been harnessed, but it is yet to be done in the Brahmaputra and the Ganga basins.

Ground Water Resources:

- The **total replenishable groundwater** resources in the country are about **432 cubic km**.
- The level of groundwater **utilisation** is relatively **high** in the river basins lying in north-western region and parts of south India. For example - Punjab, Haryana, Rajasthan, and Tamil Nadu.
- Chhattisgarh, Odisha, Kerala, etc., which utilise only a small proportion of their groundwater potentials.
- States like Gujarat, Uttar Pradesh, Bihar, Tripura, and Maharashtra are utilising their groundwater resources at a **moderate rate**.

Lagoons and Backwaters:

- India has a vast coastline, and the coast is very indented in some states. Due to this, a number of lagoons and lakes have formed. The States like Kerala, Odisha and West Bengal have vast surface water resources in these lagoons and lakes.
- Although, water is generally brackish in these water bodies, it is **used for fishing**

and irrigating certain varieties of paddy crops, coconut, etc.

Water Demand and Utilisation:

- India has traditionally been an agrarian economy, and about **two-third** of its population have been **dependent on agriculture**.
 - The agricultural production has been assigned a very high priority in the five years plans for developing irrigations increase.
 - **Multipurpose river valleys projects**, like the Bhakra-Nangal, Hirakud, Damodar Valley, Nagarjuna Sagar, Indira Gandhi Canal Project, etc., have been taken up.
 - **Agriculture** accounts for most of the **surface and groundwater utilisation**:
 - It accounts for **89 per cent** of the **surface water**.
 - It accounts for **92 per cent** of the **groundwater utilisation**.
 - While the share of **industrial sector** is limited to **2 per cent** of the **surface water utilisation** and **5 per cent** of the **groundwater**.
 - The share of **domestic sector** is **higher** (9 per cent) in **surface water utilisation** as compared to groundwater.
- Demand of Water for Irrigation:**
- In agriculture, water is mainly used for irrigation.
 - Irrigation is needed because of spatio-temporal variability in rainfall in India.
 - The large tracts of the country are deficient in rainfall and are drought prone.
 - North-western India and Deccan plateau constitute such areas.
 - Winter and summer seasons are more or less dry in most part of India.

- It is difficult to practise agriculture without assured irrigation during dry seasons.

- Even areas of ample rainfall like west Bengal and Bihar breaks in monsoon or its failure creates **dry spells** which not good for crops.
- **Water need** of certain crops also makes **irrigation necessary**. For example - water requirement of rice, sugarcane, jute, etc. is very high which can be met only through irrigation.

Significance of Irrigations:

- Provision of irrigation makes **multiple cropping possible**.
- The irrigated lands have **higher agricultural productivity** than unirrigated land.
- The **high yielding varieties** of crops need regular **moisture supply**.

Irrigation in India:

- In Punjab, Haryana, and western Uttar Pradesh, more than 85 per cent of their net sown area is under irrigation.
- Of the total net irrigated area 76.1 per cent in Punjab and 51.3 per cent in Haryana are irrigated through wells and tube wells. This shows that these states **utilise large proportion of their groundwater** potential which has resulted in groundwater depletion in these states.
- **Problems of Irrigation:** Over withdrawals in some states, like Rajasthan and Maharashtra, has increased fluoride concentration in groundwater, and this practice has led to increase in concentration of arsenic in parts of West Bengal and Bihar.

Emerging Water Problems:

- The **per capita availability of water** is **dwindling** day-by-day due to increase in population.
- The available water resources are also getting polluted due to industrial, agricultural and domestic effluents.

Deterioration of Water Quality:

Water Quality refers to purity of water, or water without unwanted foreign substances.

- Water gets **polluted by foreign matters**, such as micro-organisms, chemicals, industrial and other wastes.
 - Such matters **deteriorate the quality** of water and render it unfit for human use.
- **When toxic substances enter lakes, streams, rivers, ocean, and other water bodies**, they get dissolved or lie suspended in water.
 - This results in pollution of water, whereby quality of water deteriorates affecting aquatic systems.
 - Sometimes, these pollutants also seep down and pollute groundwater.

Water Conservation and Management:

- The need has arisen to conserve and effectively manage this precious life-giving resource for sustainable development due to **declining availability of freshwater** and **increasing demand**.
- India has to take quick steps and make effective policies and laws and adopt effective measures for its conservation as **water availability from sea/ocean**, due to high cost of desalinisation, is considered **negligible**.

- The attempts are to be made to **prevent the pollution** besides developing water-saving technologies and methods.
- There is need to encourage watershed development, rainwater harvesting, water recycling and reuse, and conjunctive use of water for sustaining water supply in long run.

Water Pollution:

- The available water resources are degrading rapidly.
- The major rivers generally retain better water quality in less densely populated upper stretches in hilly areas.
- The **drains** carrying agricultural (fertilizers and insecticides), domestic (solid and liquid wastes), and industrial effluents **join the rivers**.
- The **concentration of pollutants** in rivers, especially remains **very high** during the **summer season** when flow of water is low.
- The **Central Pollution Control Board (CPCB)** in **collaboration** with **State Pollution Control Boards** has been monitoring water quality of national aquatic resources at 507 stations.
- The data obtained from these stations show that:
 - Organic and bacterial contamination continues to be the main source of pollution in rivers.
- **Polluted Rivers:**
 - The **Yamuna river** is the **most polluted river** in India between Delhi and Etawah.
 - **Other Severely Polluted Rivers:** The Sabarmati at Ahmedabad, the Gomti

at Lucknow, the Kali, the Adyar, the Cooum (entire stretches), the Vaigai at Madurai and the Musi of Hyderabad and the Ganga at Kanpur and Varanasi.

- **Groundwater pollution** has occurred due to **high concentrations of heavy/toxic metals**, fluoride, and nitrates at different parts of India.

Ineffectiveness of Legislative Provisions:

- The Water (Prevention and Control of Pollution) Act 1974, and Environment Protection Act 1986 have not been implemented effectively.
- The Water Cess Act, 1977, meant to reduce pollution has also made marginal. Impacts.

There is a strong need to generate public awareness about importance of water and impacts of water pollution.

Recycle and Reuse of Water:

Fresh water availability can be improved by recycle and reuse.

- Use of water of lesser quality such as reclaimed wastewater would be an attractive option for industries for cooling and firefighting to reduce their water cost.
- For example - In urban areas water after bathing and washing utensils can be used for gardening. This would conserve better quality of water for drinking purposes.
- There is enormous scope for replenishing water through recycling.

Watershed Management:

- Watershed management basically **refers to efficient management and conservation of surface and groundwater resources.**
- It involves prevention of runoff and storage and recharge of groundwater through various methods like percolation tanks, recharge wells, etc.
- **In broad sense:**
 - Watershed management includes conservation, regeneration and judicious use of all resources – natural (like land, water, plants and animals) and human with in a watershed.
- **Aims:** At bringing about balance between natural resources on the one hand and society on the other.
- **Programmes for Watershed Development:**
 - **Haryali:** It is a watershed development project sponsored by the Central Government which aims at enabling the rural population to conserve water for drinking, irrigation, fisheries and afforestation.
 - The Project is being executed by Gram Panchayats with people's participation.
- **Neeru-Meeru** (Water and You) programme (in Andhra Pradesh) and **Arvary Pani Sansad** (in Alwar, Rajasthan):
 - They have taken up **constructions of various water-harvesting structures** such as percolation tanks, dug out ponds (Johad), check dams, etc., through people's participation.
- Tamil Nadu has made water harvesting structures in the house's compulsory.

**The Salient Features of National Water Policy (2012) are as follows:**

- Emphasis on the need for a **national water framework law**, comprehensive legislation for optimum development of inter-State rivers and river valleys.
- **Water**, after meeting the pre-emptive needs for safe drinking water and sanitation, achieving food security, supporting poor people dependent on agriculture for their livelihood and high priority allocation for minimum eco-system needs, be treated as **economic good** so as to promote its conservation and efficient use.
- **Ecological needs** of the **river** should be determined recognizing that river flows are characterized by low or no flows, small floods (freshets), large floods and flow variability and should accommodate development needs.
- A system to evolve benchmarks for water uses for different purposes, i.e., water footprints, and **water auditing** be developed to ensure efficient use of water. Project financing has been suggested as a tool to incentivize efficient & economic use of water.
- Setting up of **Water Regulatory Authority** has been recommended. Incentivization of recycle and re-use has been recommended.
- **Water Users Associations** should be given **statutory powers** to collect and retain a portion of water charges, manage the volumetric quantum of water allotted to them and maintain the distribution system in their jurisdiction.

Rainwater Harvesting

- Rainwater harvesting is a method to **capture** and **store rainwater** for various uses.
- It is also used to recharge groundwater aquifers.
- It is a **low cost** and **eco-friendly technique** for preserving every drop of water by guiding the rainwater to borewell, pits and wells.
- Traditional rainwater harvesting in rural areas is done by using surface storage bodies, like lakes, ponds, irrigation tanks, etc.
- In **Rajasthan**, rainwater harvesting structures locally known as **Kund or Tanka** (a covered underground

tank) are constructed near or in the house or village to store harvested rainwater.

Significance of Rainwater Harvesting:

- Rainwater harvesting **increases water availability**, checks the declining groundwater table, improves the quality of groundwater through dilution of contaminants, like fluoride and nitrates, prevents soil erosion, and flooding and arrests salt water intrusion in coastal areas if used to recharge aquifers.
- It also **decreases the community dependence on groundwater** for domestic use.

- It can also **save energy** to pump groundwater as recharge leads to rise in groundwater table.
- Urban areas can specially benefit from rainwater harvesting as water demand has already outstripped supply in most of the cities and towns.

Interesting Points:

- **Jal Kranti Abhiyaan:**
 - It was launched by the Government of India in **2015–16**.
 - **Aim:** To **ensure water security** through per capita availability of water in the country. It aims at involving local bodies, NGOs and citizens, at large, in creating awareness regarding its objectives.
 - The following activities have been proposed under the Jal Kranti Abhiyan:
 - ◆ Selection of one water stressed village in each 672 districts of the country to create a '**Jal Gram**'.
- ◆ Identification of **model command area** of about **1000 hectares** in different parts of India, for example, UP, Haryana (North), Karnataka, Telangana, Tamil Nadu (South), Rajasthan, Gujarat (West), Odisha (East), Meghalaya (North-East).
- ◆ **Abatement of pollution:**
 - Water conservation and artificial recharge.
 - Reducing groundwater pollution.
 - Construction of Arsenic-free wells in selected areas of the country
- ◆ **Creating mass awareness** through social media, radio, TV, print media, poster, and essay writing competitions in schools.
- Jal Kranti Abhiyan is designed to provide livelihood and food security through water security.

India is endowed with a rich variety of mineral resources due to its varied geological structure. The vast alluvial plain tract of north India is devoid of minerals of economic use. The mineral resources provide the country with the necessary base for industrial development.

Mineral:

A mineral is a **natural substance** of **organic or inorganic origin** with definite chemical and physical properties.

Types of Mineral Resources:

- **On the basis of Chemical and Physical Properties:** Minerals may be grouped under metallics and non-metallics:

- **Metallic Minerals:** They are the sources of **metals**. It includes Iron ore, copper, gold produce metal. Metallic minerals are further divided into:
 - **Ferrous:** All those minerals which **have iron content** are ferrous such as iron ore itself.
 - **Non-Ferrous:** Those which **do not have iron content** such as copper, bauxite, etc.
- **Non-metallic minerals:**
 - They are either **organic in origin** such as fossil fuels also known as **mineral fuels** which are derived from the buried animal and plant life such as coal and petroleum.

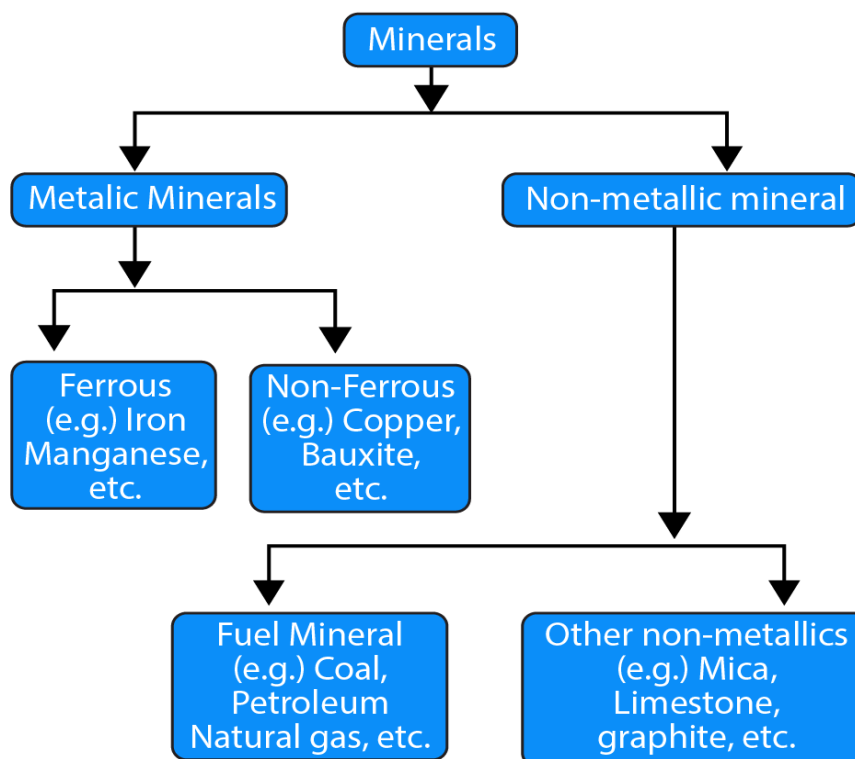


Fig. 7.1: Classification of Minerals

- Other type of non-metallic minerals is **inorganic in origin** such as mica, limestone and graphite, etc.

Characteristics of Minerals:

- These are **unevenly distributed** over space.
- There is **inverse relationship in quality and quantity** of minerals i.e., good quality minerals are less in quantity as compared to low quality minerals.
- All minerals are **exhaustible over time** as these take long to develop geologically, and they cannot be replenished immediately at the time of need.

Distribution of Minerals in India:

- Most of the **metallic minerals** in India occur in the **Peninsular Plateau** region in the old crystalline rocks.
- Over **97 per cent** of **coal reserves** occur in the valleys of Damodar, Sone, Mahanadi, and Godavari.
- Petroleum reserves** are located in the **sedimentary basins** of Assam, Gujarat and Mumbai High i.e., **offshore region in the Arabian Sea**. New reserves have been located in the Krishna-Godavari and Kaveri basins.
- Most of the major mineral resources occur to the east of a line linking Mangalore and Kanpur.

Concentration of Minerals in three broad belts in India

The North- Eastern Plateau Region:

- It covers Chotanagpur (Jharkhand), Odisha Plateau, West Bengal, and parts of Chhattisgarh.
- It has **variety of minerals** viz. iron ore, coal, manganese, bauxite, mica.

The Southern-Western Plateau Region:

- This belt extends over Karnataka, Goa and contiguous Tamil Nadu uplands and Kerala.
- This belt is rich in **ferrous metals and bauxite** and also contains high grade iron ore, manganese, and limestone.
- This belt **lacks in coal deposits** except Neyveli lignite.
- This belt does not have as diversified mineral deposits as the north-eastern belt.
- Kerala has deposits of monazite and thorium, bauxite clay and Goa has iron ore deposits.

The North-Western Region:

- This belt extends along **Aravali in Rajasthan** and **part of Gujarat** and minerals are associated with **Dharwar system of rocks**.
- Major Minerals:** Copper, zinc.
- Rajasthan** is rich in **building stones** i.e., sandstone, granite, marble.
- Gypsum and Fuller's earth deposits are also extensive.
- Dolomite and limestone provide raw materials for cement industry.
- Gujarat is known for its petroleum deposits.
- Gujarat and Rajasthan both have rich sources of salt.

The Himalayan belt is another mineral belt where copper, lead, zinc, cobalt, and tungsten are known to occur. They occur on both the eastern and western parts. Assam valley has mineral oil deposits. Besides oil resources are also found in off-shore-areas near Mumbai Coast (Mumbai High).

Ferrous Mineral:

Ferrous minerals such as iron ore, manganese, chromite, etc., provide a strong base for the **development of metallurgical industries.**

Iron Ore:

- India has the **largest reserve** of iron ore in **Asia**.
- The two main types of ore found in India are **haematite and magnetite** which has great demand in international market due to its superior quality.
- The **iron ore mines** occur in close **proximity to the coal fields** in the North-Eastern plateau region of India which adds to their advantage.
- About 95 per cent of total reserves of iron ore is located in the States of Odisha, Jharkhand, Chhattisgarh, Karnataka, Goa, Telangana, Andhra Pradesh, and Tamil Nadu.
- **In Odisha:**
 - Iron ore occurs in a series of hill ranges in Sundergarh, Mayurbhanj and Jhar.
 - **Important Mines:** Gurumahisani, Sulaipet, Badampahar (Mayurbhaji), Kiruburu (Kendujhar) and Bonai (Sundergarh).
- **In Jharkhand:**
 - It has some of the oldest iron ore mines and most of the iron and steel plants are located around them.
 - **Important Mines:** Noamundi and Gua are located in Poorbi and Pashchimi Singhbhum districts. This belt further extends to Durg, Dantewara and Bailadila.
 - Dalli, and Rajhara in Durg are the important mines of iron ore in India.

- **In Karnataka:**

- The iron ore deposits occur in Sandur-Hospet area of Ballari district, Baba Budan hills and Kudremukh in Chikkamagaluru district and parts of Shivamogga, Chitradurg and Tumakuru districts.

- **In Maharashtra:**

- **Iron Mining Regions:** The districts of Chandrapur, Bhandara and Ratnagiri.

- **In Telangana:**

- **Iron Mining Region:** Karimnagar and Warangal district of Telangana,

- **In Andhra Pradesh:**

- **Iron Mining Region:** Kurnool, Cuddapah and Anantapur districts.

- **In Tamil Nadu:**

- **Iron Mining Region:** Salem and Nilgiris districts.

Manganese:

- Manganese is an important **raw material for smelting of iron ore** and also used for manufacturing ferro alloys.
- **Manganese deposits** are found in almost **all geological formations** and it is mainly associated with **Dharwar system**.
- **Odisha** is the leading producer of Manganese.
 - Major mines are located in the central part of the iron ore belt of India, particularly in Bonai, Kendujhar, Sundergarh, Gangpur, Koraput, Kalahandi and Bolangir.
- **Karnataka** is another major producer.
 - The mines are located in Dharwar, Ballari, Belagavi, North Canara, Chikkamagaluru, Shivamogga, Chitradurg and Tumakuru.
- **Maharashtra** is also an important producer of manganese.

- They are mined in Nagpur, Bhandara and Ratnagiri districts.
- The disadvantage to these mines is that they are located far from steel plants.
- The manganese belt of Madhya Pradesh extends in a belt in Balaghat-Chhindwara-Nimar-Mandla and Jabua districts.
- Telangana, Goa, and Jharkhand are other minor producers of manganese.

Non- Ferrous Minerals:

India is **poorly endowed** with non-ferrous metallic minerals **except bauxite**.

Bauxite:

- **Uses:** Bauxite is the ore used in manufacturing of **aluminium**.
- It is found mainly in **tertiary deposits** and is associated with **laterite rocks** occurring extensively either on the



Fig. 7.2: India – Metallic Minerals (Ferrous)

plateau or hill ranges of peninsular India and also in the coastal tracts of India.

- **Odisha** happens to be the **largest producer** of Bauxite.
 - **Kalahandi** and **Sambalpur** are the leading producers. The other two areas which have been increasing their production are Bolangir and Koraput.
- The patlands of Lohardaga in Jharkhand have rich deposits.
- Gujarat, Chhattisgarh, Madhya Pradesh (M.P.) and Maharashtra are other major producers.
 - Bhavanagar, and Jamnagar in **Gujarat** have the major deposits.
 - **Chhattisgarh** has bauxite deposits in Amarkantak plateau.
 - Katni-Jabalpur area and Balaghat in **M.P.** have important deposits of bauxite.
 - Kolaba, Thane, Ratnagiri, Satara, Pune and Kolhapur in **Maharashtra** are important producers.
- Tamil Nadu, Karnataka and Goa are minor producers of bauxite.

Copper:

- Copper is an indispensable metal in the **electrical industry** for making wires, electric motors, transformers, and generators.
- **Properties:**
 - It is alloyable, malleable and ductile.
 - It is also mixed with gold to provide strength to jewellery.
- **Copper Deposits:** It occur in Singhbhum district in Jharkhand, Balaghat district in Madhya Pradesh and Jhunjhunu and Alwar districts in Rajasthan.

- **Minor Producers of Copper:** Agnigundala in Guntur District (Andhra Pradesh), Chitradurg and Hasan districts (Karnataka) and South Arcot district (Tamil Nadu).

Non-Metallic Minerals:

Mica is the important non-metallic minerals produced in India. The other minerals extracted for local consumption are limestone, dolomite and phosphate.

Mica:

- It is mainly used in the **electrical and electronic industries.**
- **Properties:** It can be **split into very thin sheets** which are **tough** and **flexible.**
- **Producing Areas:** Jharkhand, Andhra Pradesh, Telangana, and Rajasthan followed by Tamil Nadu, West Bengal, and Madhya Pradesh.
 - In **Jharkhand**, **high quality mica** is obtained in a belt extending over a distance of about 150 km, in length and about 22 km, in width in **lower Hazaribagh plateau.**
 - In **Andhra Pradesh**, Nellore district produces the best quality mica.
 - In **Rajasthan**, mica belt extends for about 320 kms from Jaipur to Bhilwara and around Udaipur.
- Mica deposits also occur in Mysuru and Hasan districts of Karnataka, Coimbatore, Tiruchirapalli, Madurai and Kanniyakumari in Tamil Nadu, Alleppey in Kerala, Ratnagiri in Maharashtra, Purulia and Bankura in West Bengal.

Energy Resources:

Mineral fuels are essential for **generation of power**, required by agriculture,

industry, transport, and other sectors of the economy.

Conventional Resources:

- Mineral fuels like coal, petroleum, and natural gas (known as **fossil fuels**), nuclear energy minerals, are the conventional sources of energy.
- These conventional sources are **exhaustible resources**.

Coal:

- **Uses:** Coal is a one of the important minerals which is mainly used in the **generation of thermal power** and smelting of iron ore.
- Coal occurs in **rock sequences** mainly of two geological ages, namely Gondwana and tertiary deposits.
- About **80 per cent** of the coal deposits in India is of **bituminous type** and is of **non-coking grade**.
- The most important **Gondwana** coal fields of India are located in **Damodar Valley**.
- They lie in **Jharkhand-Bengal coal belt** and the important coal fields in this region are Raniganj, Jharia, Bokaro, Giridih, Karanpura.
 - **Jharia** is the **largest coal field** followed by Raniganj.
- The other river valleys associated with coal are Godavari, Mahanadi, and Sone.
- **Important Coal Mining Centres:** Singrauli in Madhya Pradesh (part of Singrauli coal field lies in Uttar Pradesh), Korba in Chhattisgarh, Talcher and Rampur in Odisha, Chanda-Wardha, Kamptee and Bander in Maharashtra and Singareni in Telangana and Pandur in Andhra Pradesh.

- **Tertiary coals** occur in Assam, Arunachal Pradesh, Meghalaya, and Nagaland.
 - It is extracted from Darangiri, Cherrapunji, Mewlong and Langrin (Meghalaya); Makum, Jaipur and Nazira in upper Assam, Namchik – Namphuk (Arunachal Pradesh) and Kalakot (Jammu and Kashmir).
- The **brown coal** or **lignite** occur in the coastal areas of Tamil Nadu, Puducherry, Gujarat and Jammu and Kashmir.

Petroleum:

- **Crude petroleum** consists of **hydrocarbons of liquid and gaseous states** varying in chemical composition, colour, and specific gravity.
- It is an **essential source of energy** for all internal combustion engines in automobiles, railways, and aircraft.
- Its numerous **by-products** are processed in petrochemical industries, such as fertiliser, synthetic rubber, synthetic fibre, medicines, Vaseline, lubricants, wax, soap, and cosmetics.
- **Crude petroleum** occurs in **sedimentary rocks** of the tertiary period.
- Oil exploration and production was systematically taken up after the Oil and Natural Gas Commission was set up in 1956.
 - Till then, Digboi in Assam was the only oil producing region.
- In recent years, new oil deposits have been found at the extreme western and eastern parts of India.
 - In Assam, Digboi, Naharkatiya and Moran are important oil producing areas.
 - The major oilfields of Gujarat are Ankaleshwar, Kalol, Mehsana, Nawagam, Kosamba and Lunej.

- **Mumbai High** which lies 160 km off Mumbai was **discovered in 1973** and **production commenced in 1976**.
- Oil and natural gas have been found in **exploratory wells** in Krishna-Godavari and Kaveri basin on the east coast.
- Oil extracted from the wells is crude oil and contains many impurities. It cannot be used directly. It needs to be refined. There are **two types of refineries** in India:
 - **Field-based:** For example – Digboi.
 - **Market-based:** For example – Barauni.
- Natural Gas:**
 - The **Gas Authority of India Limited** was set up in **1984** to transport and market natural gas.
 - It is **obtained along-with oil** in all the oilfields, but exclusive reserves have been located along the eastern coast as well as (Tamil Nadu, Odisha, and Andhra Pradesh), Tripura, Rajasthan and off-shore wells in Gujarat and Maharashtra.
- Non-Conventional Energy Sources:**
 - **Fossil fuel** sources, such as coal, petroleum, natural gas and nuclear energy use **exhaustible raw materials**.
 - Sustainable energy resources are only the **renewable energy** sources like solar, wind, hydro-geothermal and biomass.
 - These energy sources are more **equitably distributed** and **environment friendly**.
 - These will provide more sustained, eco-friendly cheaper energy after the initial cost is taken care of.
- Nuclear Energy Resources:**
 - Nuclear energy has emerged as a viable source in recent times.
- **Important minerals** used for the generation of nuclear energy are **uranium** and **thorium**.
- **Uranium Deposits:**
 - They occur in the **Dharwar rocks**.
 - Geographically, uranium ores are known to occur in several locations along the **Singbhum Copper belt**.
 - It is also found in Udaipur, Alwar and Jhunjhunu districts of **Rajasthan**, Durg district of **Chhattisgarh**, Bhandara district of **Maharashtra** and Kullu district of **Himachal Pradesh**.
- **Thorium Deposits:**
 - These are mainly obtained from **monazite and ilmenite** in the beach sands along the coast of **Kerala** and **Tamil Nadu**.
 - **World's richest monazite** deposits occur in Palakkad and Kollam districts of Kerala, near Vishakhapatnam in Andhra Pradesh and Mahanadi river delta in Odisha.
- **Atomic Energy Commission** was **established in 1948** but the progress could be made only after the establishment of the **Atomic Energy Institute** at **Trombay in 1954** which was **renamed** as the **Bhabha Atomic Research Centre** in **1967**.
- **Important Nuclear Power Projects:** Tarapur (Maharashtra), Rawatbhata near Kota (Rajasthan), Kalpakkam (Tamil Nadu), Narora (Uttar Pradesh), Kaiga (Karnataka) and Kakrapar (Gujarat).
- Solar Energy:**
 - Sun rays tapped in **photovoltaic cells** can be converted into energy, known as **solar energy**.

- The two **effective processes** considered to be very effective to tap solar energy are **photovoltaics** and **solar thermal technology**.
- **Advantages of Solar thermal technology:** It is cost competitive, environment friendly and easy to construct.
- Solar energy is 7 per cent more effective than coal or oil-based plants and 10 per cent more effective than nuclear plants.
- **Uses:** It is generally used more in **appliances** like heaters, crop dryers, cookers, etc.
- The **western part** of India has **greater potential** for the development of solar energy in Gujarat and Rajasthan.

Wind Energy:

- Wind energy is **absolutely pollution free**, inexhaustible source of energy.
- **Mechanism of Energy Conversion from blowing Wind:**
 - The **kinetic energy** of wind, through turbines is converted into **electrical energy**.
- The permanent wind systems such the trade winds, westerlies and seasonal wind like monsoon have been used as source of energy.
 - The local winds, land, and sea breezes can also be used to produce electricity.
- In Rajasthan, Gujarat, Maharashtra and Karnataka, favourable conditions for wind energy exist.

Tidal and Wave Energy:

- **Ocean currents** are the storehouse of infinite energy. The ceaseless tidal waves and ocean current can be used to generate energy.
- Large tidal waves are known to occur along the west coast of India. Hence,

India has great potential for the development of tidal energy along the coasts.

Geothermal Energy:

- When the **magma** from the interior of earth, comes out on the surface, **tremendous heat** is released. This heat energy can successfully be tapped and converted to electrical energy.
- The hot water that gushes out through the geyser wells is also used in the generation of thermal energy.
- It is popularly known as **Geothermal energy**.
- In India, a geothermal energy **plant** has been commissioned at **Manikaran** in Himachal Pradesh.

Bio-energy:

- Bio-energy refers to **energy derived from biological products** which includes agricultural residues, municipal, industrial, and other wastes.
- Bioenergy is a potential source of energy conversion.
 - It can be converted into electrical energy, heat energy or gas for cooking.
 - It will also process the waste and garbage and produce energy.
- **Advantages:** This will improve economic life of rural areas in developing countries, reduce environmental pollution, enhance self-reliance, and reduce pressure on fuel wood.
- One such **project** converting municipal waste into energy is **Okhla** in Delhi.

Conservation of Mineral Resource:

- The challenge of **sustainable development** requires integration of

quest for economic development with environmental concerns.

- **Traditional methods** of resource use result into generating enormous quantity of waste as well as create other environmental problems.
- There is an urgent need to conserve the resources.
- The inexhaustible resources should be developed to replace the exhaustible resources.
- In case of metallic minerals, use of scrap metals will enable recycling of metals.
- Use of scrap is specially significant in metals like copper, lead and zinc in which India's reserves are meagre.
- Use of substitutes for scarce metals may also reduce their consumption.

- Export of strategic and scarce minerals must be reduced, so that the existing reserve may be used for a longer period.

Interesting Points:

- **Petroleum** is referred to as **liquid gold** because of its scarcity and diversified uses. According to a newspaper report (The Hindu, 05.09.2006) the Oil and Natural Gas Commission has found potential zones of natural gas reserves in Ramanathapuram district.
- The **first successful** (1890) attempt to tap the **underground heat** was made in the city of **Boise, Idaho (U.S.A.)**, where a hot water pipe network was built to give heat to the surrounding buildings. This plant is still working.

In modern times industries have become very important part of an economy. They provide employment to large labour force and contribute significantly in the total national wealth/income.

Types of Industries

On the basis of Size, Capital Investment and Labour Force employed:

Industries are classified as **large, medium, small scale, and cottage industries.**

On the basis of Ownership:

- **Public Sector:** Public sector enterprises are government/state-controlled companies or corporations funded by governments. Industries of strategic and national importance are usually in the public sector.
- **Private Sector:** They are controlled by private individuals.
- **Joint and Cooperative Sector.**

On the basis of the use of their Products:

- Basic goods industries.
- Capital goods industries.
- Intermediate goods industries.
- Consumer goods industries.

On the basis of Raw Materials used by them.

- Agriculture based industries.
- Forest-based industries.
- Mineral-based industries.
- Industrially processed raw material-based industries.

On the Nature of the Manufactured Products:

Eight classes of industries thus identified are:

- Metallurgical Industries.
- Mechanical Engineering Industries.
- Chemical and Allied Industries.
- Textile Industries
- Food Processing Industries.
- Electricity Generation.
- Electronics.
- Communication Industries.

Location of Industries:

Location of industries is influenced by several factors like access to raw materials, power, market, capital, transport, and labour, etc.

- Relative significance of these factors varies with time and place.
- There is strong relationship between raw material and type of industry.
- It is economical to locate the manufacturing industries at a place where cost of production and delivery cost of manufactured goods to consumers are the least.
- Transport costs, to a great extent, depend on the nature of raw materials and manufactured products.

Factors influencing the Location of Industries

Raw Material:

- Industries using **weight-losing raw materials** are located in the regions where raw materials are located.
- Also, the locations of pulp industry, copper smelting and pig iron industries are located near their raw materials.
- Both the Coal and iron ore are **weight-losing raw materials** in iron and steel industries. Hence, an optimum location for iron and steel industries should be near raw material sources.

- Similarly, industries based on **perishable raw materials** are also located close to raw material sources.

Power:

- Power provides the **motive force for machines**, and therefore, its supply has to be ensured before the location of any industry.
- However, certain industries, like aluminium and synthetic nitrogen manufacturing industries tend to be located near sources of power because they are **power intensive** and require huge quantum of electricity.

Market:

- Markets provide the **outlets for manufactured products**.
- Heavy machine, machine tools, heavy chemicals are located near the **high demand areas** as these are market orientated.
- Cotton textile industry uses a non-weight-losing raw material and is generally located in large urban centre, e.g., Mumbai, Ahmedabad, Surat, etc.
- **Petroleum refineries** are also located near the markets as the transport of crude oil is easier and several products derived from them are used as raw material in other industries. For example - Koyali, Mathura and Barauni refineries.

Transport:

- The transport links help to develop areas as nodal point. The industries shifted to interior locations, only when railway lines were laid.
- All major industrial plants are located on the trunk rail routes.

Labour:

- Industries require skilled labour. In India, labour is quite mobile and is available in large numbers due to our large population.

Historical Factors:

- The locations like Mumbai, Kolkata and Chennai were greatly influenced by our colonial past.
- During the **initial phase of colonisation**, manufacturing activities received new impetus provided by the European traders.
 - Places like Murshidabad, Dhaka, Bhadohi, Surat, Vadodara, Kozhikode, Coimbatore, Mysuru etc., emerged as important manufacturing centres.
- In the **subsequent industrial phase of colonialism**:
 - The manufacturing centres experienced rapid growth due to competition from the goods manufactured in Britain and the discriminatory policies of colonial power.
- In the **last phase of colonialism**:
 - The British promoted few industries in selected areas which led to larger spatial coverage by different types of industries in the country.

Industrial Policy:

- India, being a democratic country aims at bringing about economic growth with **balanced regional development**.
- Establishment of iron and steel industry in Bhilai and Rourkela were based on decision to develop backward tribal areas of the country.

- At present, government of India provides lots of incentives to industries locating in backward areas.

Major Industries

The Iron and Steel Industry:

- The development of the iron and steel industry opened the doors to **rapid industrial development** in India.
- Almost all sectors of the Indian industry depend heavily on this industry for their basic infrastructure.
- The **other raw materials** besides iron ore and coking coal, essential for iron and steel industry are limestone, dolomite, manganese, and fire clay.
- The **best location** for the iron and steel plants is near the source of raw materials as all the raw materials are gross (**weight losing**).
- In India, there is a **crescent shaped region** comprising parts of Chhattisgarh, Northern Odisha, Jharkhand, and western West Bengal, which is extremely rich in high grade iron ore, good quality coking coal and other supplementing raw materials.
- The Indian iron and steel industry consists of large integrated steel plants as well as mini steel mills. It also includes secondary producers, rolling mills and ancillary industries.
- The **rivers Subarnarekha** and **Kharkai** provide water to the plant.
- The iron ore for the plant is obtained from Noamundi and Badam Pahar and coal is brought from Joda mines in Odisha.
- Coking coal comes from Jharia and west Bokaro coalfields.

Indian Iron and Steel Company (IISCO):

- The IISCO set up its **first factory** at **Hirapur** and later on another at Kulti.
- In 1937, the Steel corporation of Bengal was constituted in association with IISCO and set up another iron and steel producing unit at Burnpur (West Bengal).
- All the three plants under IISCO are **located** very **close to Damodar valley coal fields** (Raniganj, Jharia, and Ramgarh).
- Iron ore comes from Singhbhum in Jharkhand.
- Water is obtained from the **Barakar River**, a tributary of the Damodar.
- All the plants are located along the Kolkata-Asansol railway line.
- Unfortunately, steel production from IISCO fell considerably in 1972-73 and the plants were taken over by the government.

Visvesvaraya Iron and Steel Works Ltd. (VISL)

- The third integrated steel plant, the Visvesvaraya Iron and Steel Works, initially called the **Mysore Iron and Steel Works**, is located close to an iron ore producing area of Kemangundi in the Bababudan hills.
- Limestone and manganese are also locally available.

Integrated Steel Plant

Tata Iron and Steel Company (TISCO):

- The Tata Iron and Steel plant lies very close to the Mumbai-Kolkata railway line and about 240 km away from Kolkata, which is the nearest port for the export of steel.

- This region has **no coal**.
 - At the beginning, charcoal obtained by burning wood from nearby forests was used as fuel till 1951.
 - Afterwards, **electric furnaces** were installed which use hydroelectricity from the Jog Falls hydel power project.
- The Bhadravati river supplies water to the plant.
- This plant produces specialised steels and alloys.

After independence, during the Second Five Year Plan (1956-61), three new integrated steel plants were set up with foreign collaboration: **Rourkela** in Odisha, **Bhilai** in Chhattisgarh and **Durgapur** in West Bengal.

- These were public sector plants under **Hindustan Steel Limited (HSL)**.
- In **1973**, the **Steel Authority of India Limited (SAIL)** was **created** to manage these plants.

Rourkela Steel Plant:

- It was set up in **1959** in the **Sundargarh district of Odisha** in collaboration with **Germany**.
- The plant was located on the basis of proximity to raw materials, thus, minimising the cost of transporting weight losing raw material.
- This plant has a unique locational advantage, as it receives coal from Jharia (Jharkhand) and iron ore from Sundargarh and Kendujhar.
- The **Hirakud project** supplies **power for the electric furnaces** and **water** is obtained from the **Koel** and **Sankh rivers**.

Bhilai Steel Plant:

- It was established with **Russian collaboration** in Durg district of Chhattisgarh and started production in 1959.
- Iron ore comes from Dalli-Rajhara mine and coal from Korba and Kargali coal fields.
- Water comes from the **Tanduladam** and the power from the Korba Thermal Power Station.
- This plant also lies on the Kolkata-Mumbai railway route.
- The bulk of the steel produced goes to the Hindustan Shipyard at Vishakhapatnam.

Durgapur Steel Plant:

- Durgapur Steel Plant in West Bengal was set up in collaboration with the government of the **United Kingdom** and started production in 1962.
- This plant lies in Raniganj and Jharia coal belt and gets iron ore from Noamundi.
- Durgapur lies on the main Kolkata-Delhi railway route.
- Hydel power and water is obtained from the **Damodar Valley Corporation (DVC)**.

Bokaro Steel Plant:

- This steel plant was set up in 1964 at Bokaro with Russian collaboration.
- It was set up on the principle of transportation cost minimisation by creating Bokaro-Rourkela combine.
- It receives iron ore from the Rourkela region and the wagons on return take coal to Rourkela. Other raw materials come to Bokaro from within a radius of about 350 km.
- **Water and hydel power** is supplied by the **Damodar Valley Corporation**.



Other- Steel Plants:

- New steel plants which were set up in the Fourth Plan period are away from the main raw material sources. All three plants are located in South India.
 - The **Vizag Steel Plant**, in Vishakhapatnam in Andhra Pradesh is the **first port-based plant** which started operating in 1992. Its port location is of advantage.
 - The Vijaynagar Steel Plant at Hosapete in Karnataka was developed using indigenous technology. This uses local iron ore and limestone.
 - The Salem Steel Plant in Tamil Nadu was commissioned in 1982.
- Apart from these major steel plants, there are more than 206 units located in different parts of the country. Most of these use scrap iron as their main raw material and process it in electric furnaces.

The Cotton Textile Industry:

- It is one of the traditional industries of India. In the ancient and the medieval times, it used to be only a cottage industry.
- India was famous worldwide for the production of muslin, a very fine variety of cotton cloth, calicos, chintz, and other different varieties of fine cotton cloth.

Factors responsible for development of Cotton Textile Industry in India:

- India is a tropical country and cotton is the most comfortable fabric for a hot and humid climate.
- A large quantity of cotton was grown in India.

- Abundant skilled labour required for this industry was available in India. Initially, the British did not encourage the development of the indigenous cotton textile industry.
- They exported raw cotton to their mills in Manchester and Liverpool and brought back the finished products to be sold in India.
- This cloth was cheaper because it was produced at mass scale in factories in U.K. as compared to the cottage-based industries of India.
- In **1854**, the **first modern cotton mill** was established in **Mumbai**. This city had several advantages as a cotton textile manufacturing centre.
 - It was very close to the cotton producing areas of Gujarat and Maharashtra.
 - **Availability of Cotton:** Raw cotton used to be brought to Mumbai port to be transported to England.
 - **Availability of Capital:** Mumbai was the financial centre and it had the capital needed to start an industry.
 - **Availability of Labour:** The cheap and abundant labour was available locally.
 - The machinery required for a cotton textile mill could be directly imported from England.
- Subsequently, two more mills, the **Shahpur Mill** and the **Calico Mill** were established in **Ahmedabad**.
- **Division of Cotton Textile Industry:** The organised sector and the unorganised sector.
- The production of the **organised sector** has drastically fallen from **81 per cent**



Fig. 8.1: Cotton Textile Industries

in the mid-twentieth century to only **about 6 per cent** in **2000**.

- At present, the power looms on the decentralised sector produce more than the handloom sector.

Location of Cotton industry:

- Cotton is a “pure” raw material which **does not lose weight** in the manufacturing process. So other factors, like, power to drive the looms, labour, capital or

market may determine the location of the industry.

- At present the trend is to locate the industry at or close to markets:
 - As it is the market that decides what kind of cloth is to be produced.
 - Also, the market for the finished products is extremely variable, therefore, it becomes important to locate the mills close to the market.

Development of Cotton Industry in India:

- After the **first mills were set up in Mumbai and Ahmedabad** in the second half of the nineteenth century, the cotton textile industry expanded very rapidly.
- After 1921, with the development of the railway network other cotton textile centres expanded rapidly.
- In **Southern India**, mills were set up at Coimbatore, Madurai, and Bengaluru.
- In **Central India**, Nagpur, Indore, Solapur, and Vadodara became cotton textile centres.
- The development of **hydroelectricity** also favoured the location of the cotton textile mills away from the cotton producing areas.
- **Lower labour costs** at centres like Ujjain, Bharuch, Agra, Hathras, Coimbatore and Tirunelveli also caused industries to be located away from cotton producing areas.
- Presently, the **major centres of the cotton textile** industry are Ahmedabad, Bhiwandi, Solapur, Kolhapur, Nagpur, Indore, and Ujjain.
 - All these centres are the traditional centres and are located close to the cotton producing regions.

- Maharashtra, Gujarat, and Tamil Nadu are the leading cotton producing states.

Sugar Industry:

- It is the second most important agro-based industry in the country.
- **India** is the **largest producer of both sugarcane and cane sugar** and contributes about 8 per cent of world. khandasari and gur or jaggery are also prepared from sugarcane.
- Sugar industry is a **seasonal industry** because of the seasonality of raw materials.
- Development of the industry on modern lines dates back to 1903, when a sugar mill was started in Bihar.

Location of the Sugar Industry:

Sugar factories are located within the **cane producing regions**.

- Sugarcane is a **weight-losing crop**. The ratio of sugar to sugarcane varies between 9 to 12 per cent depending on its variety.
- Its sucrose content begins to dry during haulage after it has been harvested from the field.
- Better recovery of sugar is dependent upon its being crushed within 24 hours of its harvesting.
- **Leading Producers of Sugar:**
 - **Maharashtra** has emerged as a **leading sugar producer** in India and produces more than **one-third** of the total production of the sugar in the country.
 - **Uttar Pradesh is the second largest producer of sugar**. The sugar factories are concentrated in two

belts – the Ganga-Yamuna doab and the tarai region.

- In **Tamil Nadu**, sugar factories are located in Coimbatore, Vellore, Tiruvanamalai, Villupuram and Tiruchchirappalli districts.
- Belagavi, Ballari, Mandya, Shivamogga, Vijayapura and Chitradurg districts are the major producers in **Karnataka**.
- The industry is distributed in the **coastal regions** i.e. East Godavari, West Godavari, Vishakhapatnam districts of Andhra Pradesh and Nizamabad and Medak districts of Telangana.
- The other States which produce sugar are Bihar, Punjab, Haryana, Madhya Pradesh and Gujarat.

Petrochemical Industry:

Many items are **derived from crude petroleum**, which provide raw materials for many new industries, these are collectively known as **petrochemical industries**.

- This group of industries is divided into **four sub-groups**: polymers, synthetic fibres, elastomers, and surfactant intermediate.
- Mumbai is the hub of the petrochemical industries.
- **Location of Cracker units**: Auraiya (Uttar Pradesh), Jamnagar, Gandhinagar and Hajira (Gujarat), Nagothane, Ratnagiri (Maharashtra), Haldia (West Bengal) and Vishakhapatnam (Andhra Pradesh). Three organisations are working in the petrochemical sector under the administrative control of the **Department of Chemicals and Petrochemicals**.

• **Indian Petrochemical Corporation Limited (IPCL):**

- It is responsible for the manufacture and distribution of the various petrochemicals like polymers, chemicals, fibres and fibre intermediates.

• **Petrofils Cooperative Limited (PCL):**

- It is a **joint venture** of the Government of India and Weaver's Cooperative Societies.
- It produces polyester filament yarn and nylon chips at its two plants located at Vadodara and Naldhari in Gujarat.

• **Central Institute of Plastic Engineering and Technology (CIPET):**

- It involved in imparting training in petro-chemical industry.

Polymers:

- Polymers are made from **ethylene and propylene**.
- These materials are obtained in the process of refining crude oil.
- Polymers are used as raw materials in the plastic industry.
- Among polymers, polyethylene is a widely used thermoplastic.
- Plastic is first converted into sheets, powder, resin and pellets, and then used in manufacturing plastic products.
- Plastic products are preferred because of their strength, flexibility, water and chemical resistance and low prices.
- The **National Organic Chemicals Industries Limited (NOCIL)**, established in private sector in 1961, started the **first naphtha based chemical industry** in Mumbai.

Synthetic Fibres:

- They are widely used in the manufacturing of fabrics because of their inherent strength, durability, washability, and resistance to shrinkage.
- Industries manufacturing nylon and polyester yarns are located at Kota, Pimpri, Mumbai, Modinagar, Pune, Ujjain, Nagpur and Udhna.

Knowledge Based Industries:

- The Information Technology (IT) revolution opened up new possibilities of economic and social transformation.
- The IT and IT enabled business process outsourcing (ITESBPO) services continue to be on a robust growth path.
- Indian software industry has emerged as one of the fastest growing sectors in the economy.
- The software industry has surpassed electronic hardware production.

Liberalisation, Privatisation, Globalisation (LPG) and Industrial Development:

The **new Industrial Policy** was announced in **1991**.

- **Major Objectives of Policy:** To build on the gains already made, correct the distortions or weaknesses that have crept in, maintain a sustained growth in productivity and gainful employment and attain international competitiveness.
- **Measures initiated under the policy:**
 - Abolition of industrial licensing.
 - Free entry to foreign technology.
 - Foreign investment policy.
 - Access to capital market.
 - Open trade.

- Abolition of phased manufacturing programme,
- Liberalised industrial location programme.
- The policy has **three main dimensions:** liberalisation, privatisation, and globalisation.
- The **industrial licensing system** has been **abolished** for all except six industries related to security, strategic or environmental concerns.
 - Industries related to atomic energy; substances specified in the Schedule of the Department of Atomic Energy and Railways have remained under the public sector.
- The government also has decided to offer a part of the shareholdings in the public enterprises to financial institutions, general public and workers.
- The threshold limits of assets have been scrapped and no industry requires prior approval for investing in the delicensed sector.
- Foreign Direct Investment (FDI) has been seen as a supplement to the domestic investment for achieving a higher level of economic development.
 - FDI benefits the domestic industry and the consumers by providing technological upgradation, access to global managerial skills and practices, optimum use of natural and human resources, etc.
- The government has also announced changes in the industrial location policies. Industries are discouraged in or very close to large cities due to environmental reasons.



- The industrial policy has been liberalised to attract private investor both domestic and multi-nationals.
 - New sectors like, mining, telecommunications, highway construction and management have been thrown open to private companies.

Critical Analysis of FDI:

There has been a big gap between approved and actual foreign direct investment, even though the number of foreign collaborations is increasing.

Globalisation:

- Globalisation means integrating the economy of the country with the world economy.
 - Under this process, goods, and services along with capital, labour and resources can **move freely** from one nation to another.
- **Thrust of Globalisation:** To increase the domestic and external competition through extensive application of market mechanism and facilitating dynamic relationship with the foreign investors and suppliers of technology.
- **In the Indian context:**
 - Opening of the economy to foreign direct investment by providing facilities to foreign companies to invest in different fields of economies activity in India.
 - Removing restrictions and obstacles to the entry of multinational companies in India.
 - Allowing Indian companies to enter into foreign collaboration in India

and also encouraging them to set up joint ventures abroad.

- Carrying out massive import liberalisation programmes by switching over from quantitative restrictions to tariffs in the first place, and then bringing down the level of import duties considerably.
- Instead of a set of export incentives, opting for exchange rate adjustments for promoting export.

Industrial Regions in India:

- Industries are **not evenly distributed** in the country.
 - They tend to concentrate on certain locations because of the favourable locational factors.
- Several indices are used to identify the clustering of industries:
 - The number of industrial units.
 - Number of industrial workers.
 - Quantum of power used for industrial purposes.
 - Total industrial output.
 - Value added by manufacturing.

Table 8.1: Major Industrial Regions of the Country

Industrial Regions and Districts

Major Industrial Regions (8)

1. Mumbai-Pune Region 2. Hugli Region, 3. Bengaluru-Tamil Nadu Region, 4. Gujarat Region 5. Chotanagpur Region, 6. Vishakhapatnam-Guntur Region, 7. Gurugram-Delhi-Meerut Region, and 8. Kollam-Thiruvananthapuram Region

Minor Industrial Regions (13)

1. Ambala-Amritsar, 2. Sharanpur-Muzaffarnagar-Bijnor, 3. Indore-Dewas-Ujjain, 4. Jaipur-Ajmer, 5. Kolhapur-South Kannada, 6. Northern Malabar, 7. Middle Malabar, 8. Adilabad-Nizamabad, 9. Allahabad-Varanasi-Mirzapur, 10. Bhojpur-Munger, 11. Durg-Raipur, 12. Bilaspur-Korba, and 13. Bramaputra Valley.

Industrial Districts (15)

1. Kanpur, 2. Hyderabad, 3. Agra, 4. Nagpur, 5. Gwalior, 6. Bhopal, 7. Lucknow, 8. Jalpaiguri, 9. Cuttack, 10. Gorakhpur, 11. Aligarh, 12. Kota, 13. Purnia, 14. Jabalpur, and 15. Bareilly

Mumbai-Pune Industrial Region:

- It extends from **Mumbai-Thane to Pune** and in adjoining districts of Nashik and Solapur.
- With the development of cotton textile industry, chemical industry also developed.
- Opening of the Mumbai High petroleum field and erection of nuclear energy plants added additional pull to this region.
- Besides, engineering goods, petroleum refining, petrochemicals, leather, synthetic and plastic goods, drugs, fertilisers, electrical, shipbuilding, electronics, software, transport equipment and food industries also developed.
- **Important Industrial Centres:** Mumbai, Kolaba, Kalyan, Thane, Trombay, Pune, Pimpri, Nashik, Manmad, Solapur,

Kolhapur, Ahmednagar, Satara and Sangli.

Hugali Industrial Region:

- It is located along the **Hugli river** and extends from **Bansberia** in the **north** to **Birlanagar** in the **south** for a distance of about 100 km.
 - Industries also have developed in Medinipur in the west.
 - Kolkata-Haora from the nucleus of this industrial region.
- Historical, geographical, economic and political factors have contributed much to its development.
 - Kolkata was connected with interior parts by railway lines and road routes.
 - Development of tea plantations in Assam and northern hills of West Bengal, the processing of indigo earlier and jute later **coupled** with the opening of coalfields of the Damodar Valley and iron ore deposits of the Chotanagpur plateau.
 - **Cheap labour** available from thickly populated part of Bihar, eastern Uttar Pradesh and Odisha also contributed to its development.
 - Kolkata, being the capital city of British India (1773-1911), attracted the **British capital**.
 - The establishment of first jute mill at Rishra in 1855 ushered in the era of modern industrial clustering in this region.
- Cotton textile industry also grew along with jute industry, paper, engineering, textile machinery, electrical, chemical, pharmaceuticals, fertiliser and petrochemical industries.

- **Landmarks of Region:** Factory of the Hindustan Motors Limited at Konnagar and diesel engine factory at Chittaranjan.
- **Important Industrial Centres:** Kolkata, Haora, Haldia, Serampur, Rishra, Shibpur, Naihati, Kakinara, Shamnagar, Titagarh, Sodepur, Budge Budge, Birlanagar, Bansberia, Belgurriah, Triveni, Hugli, Belur, etc.

Bengaluru-Chennai Industrial Region:

- Till 1960, industries were confined to Bengaluru, Salem and Madurai districts but now they have spread over all the districts of Tamil Nadu except Viluppuram.
 - Since, this region is away from the coalfields, its development is dependent on the Pykara hydroelectric plant, which was built in 1932.
 - Cotton textile industry was the first to take roots due to the presence of cotton growing areas.
 - Along with cotton mills, loom industry spread very rapidly.
 - Several heavy engineering industries converged at Bengaluru.
- **Industrial Landmarks of Region:** Aircraft (HAL), machine tools, telephone (HTL) and Bharat Electronics.
- **Important Industries:** textiles, rail wagons, diesel engines, radio, light engineering goods, rubber goods, medicines, aluminium, sugar, cement, glass, paper, chemicals, film, cigarette, match box, leather goods, etc.

Gujarat Industrial Region:

- The nucleus of this region lies **between Ahmedabad and Vadodara**, but this

region extends upto Valsad and Surat in the south and to Jamnagar in the west.

- **Development of this Region:**

- It is associated with the location of the cotton textile industry since 1860s.
- Located in cotton growing area, this region has double advantage of the proximity of raw materials as well as of market.
- The discovery of oilfields led to the establishment of petrochemical industries around Ankleshwar, Vadodara and Jamnagar.
- The port at Kandla helped in the rapid growth of this region.
- Petroleum refinery at Koyali provided raw materials to a host of petrochemical industries.

- **Diverse Industrial Structure:** Besides, textiles (cotton, silk and synthetic fabrics) and petrochemical industries, other industries are heavy and basic chemicals, motor, tractor, diesel engines, textile machinery, engineering, pharmaceuticals, dyes, pesticides, sugar, dairy products and food processing.

- Recently, **largest petroleum refinery** has been set up at **Jamnagar**.

- **Important Industrial Centres:** Ahmedabad, Vadodara, Bharuch, Koyali, Anand, Khera, Surendranagar, Rajkot, Surat, Valsad and Jamnagar.

Chotanagpur Region:

- This region extends over Jharkhand, northern Odisha and western West Bengal and is **known for the heavy metallurgical industries**.

- **Reasons for development:**

- Proximity of coal, iron ore and other minerals facilitated the location of heavy industries in this region.
- The thermal and hydroelectric plants have been constructed in the Damodar Valley to meet the power requirement.
- Densely populated surrounding regions provide cheap labour.
- Hugli region provides vast market for its industries.

- **Important Industries:** Heavy engineering, machine tools, fertilisers, cement, paper, locomotives, and heavy electricals.

- **Important Centres:** Ranchi, Dhanbad, Chaibasa, Sindri, Hazaribag, Jamshedpur, Bokaro, Rourkela, Durgapur, Asansol and Dalmianagar.

Vishakhapatnam-Guntur Region:

- This industrial region extends from **Vishakhapatnam district to Kurnool and Prakasam districts in the south.**

- **Reasons for Development:**

- Industrial development of this region hinges upon Vishakhapatnam and Machilipatnam ports and developed agriculture and rich reserves of minerals in their hinterlands.
- Coalfields of the Godavari basin provide energy.
- Petroleum refinery based on imported petroleum facilitated the growth of several petrochemical industries.

- Ship building industry was started at Vishakhapatnam in 1941.

- **Principal Industries:** Sugar, textile, jute, paper, fertiliser, cement, aluminium and light engineering.

- **Important Centres:** Vishakhapatnam, Vijayawada, Vijaynagar, Rajahmundry, Guntur, Eluru and Kurnool.

Gurugram-Delhi -Meerut Region:

- This region is located far away from the mineral and power resources, and therefore, the **industries are light and market oriented.**

- **Major Industries:** Electronics, light engineering and electrical goods. Besides, there are cotton, woollen and synthetic fabrics, hosiery, sugar, cement, machine tools, tractor, cycle, agricultural implements, chemical and vanaspati industries.

- To the south lies the **Agra-Mathura industrial area**, which specialises in glass and leather goods. Mathura with an oil refinery is a petrochemical complex.

Kollam-Thiruvananthapuram Region:

- This industrial region is spread over Thiruvananthapuram, Kollam, Alappuzha, Ernakulam and Alappuzha districts.

- Plantation, agriculture, and hydropower provide industrial base to this region.

- Agricultural products processing and market-oriented light industries predominate the region and its is located far from the mineral belt of the country.

- Location of petroleum refinery at Kochchi has added a vista of new industries to this region.

- **Important Industries:** cotton textile, sugar, rubber, matchbox, glass, chemical fertiliser and fish-based industries are important. Food processing, paper, coconut coir products, aluminium and cement industries are also significant.

- **Important Industrial Centres:** Kollam, Thiruvananthapuram, Alluva, Kochchi, Alappuzha and Punalur.

9

Planning and Sustainable Development in Indian Context

The word 'planning' has been used with reference to the process of economic development. It is different from the traditional hit-and-miss methods by which reforms and reconstruction are often undertaken.

Approach of Planning:

There are two approaches to planning, i.e., sectoral planning and regional planning.

Sectoral Planning:

It means **formulation** and **implementation** of the sets of schemes or programmes **aimed** at development of **various sectors** of the economy, such as agriculture, irrigation, manufacturing, power, etc.

Regional Planning:

The uneven pattern of development over space necessitates that the planners have a spatial perspective and draw the plans **to reduce regional imbalance** in development. This type of planning is termed as **regional planning**.

Target Area Planning:

- The **planning process** has to take **special care** of those areas which have remained economically backward.
- Economic development of a region depends upon its resource base but sometimes resource-rich region also remains backward.
- **Economic development** requires **technology**, as well as **investment besides resources**.
- In order to arrest the accentuation of regional and social disparities, the

Planning Commission introduced the '**target area**' and **target group approaches** to planning.

- **Examples of Programmes towards the development of Target Areas:** Command Area Development Programme, Drought Prone Area Development Programme, Desert Development Programme, Hill Area Development Programme.
- **Target Group Programme:** The Small Farmers Development Agency (SFDA) and Marginal Farmers Development Agency (MFDA).
- In the **8th Five Year Plan** special area programmes were designed to develop infrastructure in hill areas, north-eastern states, tribal areas, and backward areas.

Hill Area Development Programme:

- These were initiated during the **Fifth Five Year Plan** covering 15 districts comprising all the hilly districts of Uttar Pradesh (present Uttarakhand), Mikir Hill and North Cachar hills of Assam, Darjeeling district of West Bengal and Nilgiri district of Tamil Nadu.
- The **National Committee on the Development of Backward Area** in 1981 recommended:
 - All the hill areas in the country having height above 600 m and not covered under tribal sub-plan be treated as backward hill areas.
- The detailed plans for the development of hill areas were drawn keeping in view their topographical, ecological, social, and economic conditions.
- **Aim:** Harnessing the indigenous resources of the hill areas through development of horticulture, plantation, agriculture, animal husbandry, poultry,

forestry and small-scale and village industry.

Drought Prone Area Programme:

- This programme was initiated during the **Fourth Five Year Plan** with the **objectives** of **providing employment** to the people in drought-prone areas and creating productive assets.
- It emphasised on irrigation projects, land development programmes, afforestation, grassland development and creation of basic rural infrastructure, such as electricity, roads, market, credit, and services.
- The National Committee on Development of Backward Areas reviewed the performance of this programme.
- This programme is largely **confined to the development of agriculture and allied sectors** with major focus on restoration of ecological balance.
- Adoption of integrated watershed development approach at the micro-level.
- The restoration of ecological balance between water, soil, plants, and human and animal population should be a basic consideration in the strategy of development of drought-prone areas.
- The **Irrigation Commission (1972)** introduced the criterion of 30 per cent irrigated area and demarcated the drought-prone areas.
- **Drought Prone Areas in India:** It spread over semi-arid and arid tract of Rajasthan, Gujarat, Western Madhya Pradesh, Marathwada region of Maharashtra, Rayalaseema and Telangana plateaus of Andhra Pradesh, Karnataka plateau and highlands and interior parts of Tamil Nadu.

- In fifth five-year plan tribal sub plan was introduced.
 - The most significant contribution of tribal sub-plan was the development of infrastructure in terms of schools, healthcare facilities, potable water, etc.

Sustainable Development Development:

- The term development is generally used to describe the state of particular societies and the process of changes experienced by them.
- The development is a **multi-dimensional concept** and signifies the positive, irreversible transformation of the economy, society, and environment.

Post-World War II Era:

- The concept of development was synonymous to economic growth which is measured in terms of temporal increase in gross national product (GNP) and per capita income/per capita consumption.
- But even the countries having high economic growth, experienced speedy rise in poverty because of its unequal distribution.

In 1970s:

- The phrases such as **redistribution with growth** and growth and equity were incorporated in the definition of development.
- It was realised that the concept of development cannot be restricted to the economic sphere alone.
- It also includes the issues such as improving the well-being and living

standard of people, availing of the health, education, and equality of opportunity, and ensuring political and civil rights.

By 1980s:

- Development emerged as a concept encapsulating wide-spread improvement in social as well as material wellbeing of all in a society.

Sustainable Development:

- The notion of sustainable development emerged in the wake of general rise in the awareness of environmental issues in the late 1960s in Western World. It reflected the concern of people about undesirable effects of industrial development on the environment.
- The publication of **'The Population Bomb'** by **Ehrlich** in 1968 and **'The Limits to Growth'** by **Meadows and others** in 1972 further raised the level of fear among environmentalists in particular and people in general. This sets the

scenario for the emergence of new models of development under a broad phrase **'sustainable development.'**

- The **United Nations** established a **World Commission on Environment and Development (WCED)** headed by the Norwegian Prime Minister Gro Harlem Brundtland.
 - The Commission gave its report (also known as Brundtland Report) entitled **'Our Common Future'** in 1987.
 - The report defines sustainable development as a "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."
- Sustainable development takes care of ecological, social, and economic aspects of development during the present times and pleads for conservation of resources to enable the future generations to use these resources.

Case Study: Indira Gandhi Canal (Nahar) Command Area:

- Indira Gandhi Canal, previously known as the **Rajasthan Canal**, is one of the largest canal systems in India.
- The canal **originates** at **Harike barrage** in Punjab and runs parallel to Pakistan border at an average distance of 40 km in Thar Desert (Marusthali) of Rajasthan.
- The **total planned length** of the system is **9,060 km** catering to the irrigation needs of a total culturable command area of 19.63 lakh hectares.
- **Command Area of Stage-I:** Ganganagar, Hanumangarh and northern part of Bikaner districts.
 - It has a gently undulating topography and its culturable command area is 5.53 lakh hectares.
- **Command Area of Stage-II:** Bikaner, Jaisalmer, Barmer, Jodhpur, Nagaur and Churu districts covering culturable command area of 14.10 lakh ha.
- **Traditional Crops Sown in the area:** gram, bajra and jowar have been replaced by wheat, cotton, groundnut, and rice.

Measures to Promote Sustainable Development:

Five of the seven measures proposed to promote sustainable development in the command area are meant to restore ecological balance.

- The first requirement is strict implementation of water management policy. The canal project envisages protective irrigation in Stage-I and extensive irrigation of crops and pasture development in Stage-II.
 - In general, the cropping pattern shall not include water intensive crops. It shall be adhered to and people shall be encouraged to grow plantation crops such as citrus fruits.
 - The CAD programmes such as lining of water courses, land development and levelling and warabandi system (equal distribution of canal water in the command area of outlet) shall be effectively implemented to reduce the conveyance loss of water.
 - The areas affected by water logging and soil salinity shall be reclaimed.
 - The eco-development through afforestation, shelterbelt plantation and pasture development is necessary particularly in the fragile environment of Stage-II.
- The social sustainability in the region can be achieved only if the land allottees having poor economic background are provided adequate financial and institutional support for cultivation of land.
 - The economic sustainability in the region cannot be attained only through development of agriculture and animal husbandry. The agricultural and allied activities have to develop alongwith other sectors of economy.

Interesting Points:

- **NITI Aayog:**
 - India adopted centralised planning after Independence, but subsequently, it graduated into decentralised multi-level planning. The responsibility of plan formulation was with the Planning Commission at the Centre, State, and district levels.
 - But on **1 January 2015**, the **Planning Commission was replaced by the NITI Aayog**.
 - It was set up with the objective of involving the states in economic policy making for India for providing strategic and technical advice to the Central and State governments.



Unit: IV

The use of transport and communication depends upon need to move things from place of their availability to the place of their use. Human beings use various methods to move goods, commodities, ideas from one place to another.

Land Transport:

- The pathways and unmetalled roads have been used for transportation in India since ancient times.
- With the economic and technological development, metalled roads and railways were developed to move large volume of goods and people from one place to another.

Road Transport:

- India has one of the **second largest road** networks in the world with a total

length of about **56 lakh km** (morth.nic.in, Annual Report 2017-18).

- Roads carry **about 85 per cent of passenger** and **70 per cent of freight traffic** every year.
- It is relatively **suitable** for **shorter distance travel**.
- Serious attempt was made in 1943 when '**Nagpur Plan**' was drawn to build roads in India, but this plan could not be implemented due to lack of coordination.

National Highways:

- These are the main roads which are constructed and maintained by the **Central Government**.
- **Importance:**
 - These roads are meant for **inter-state transport** and movement

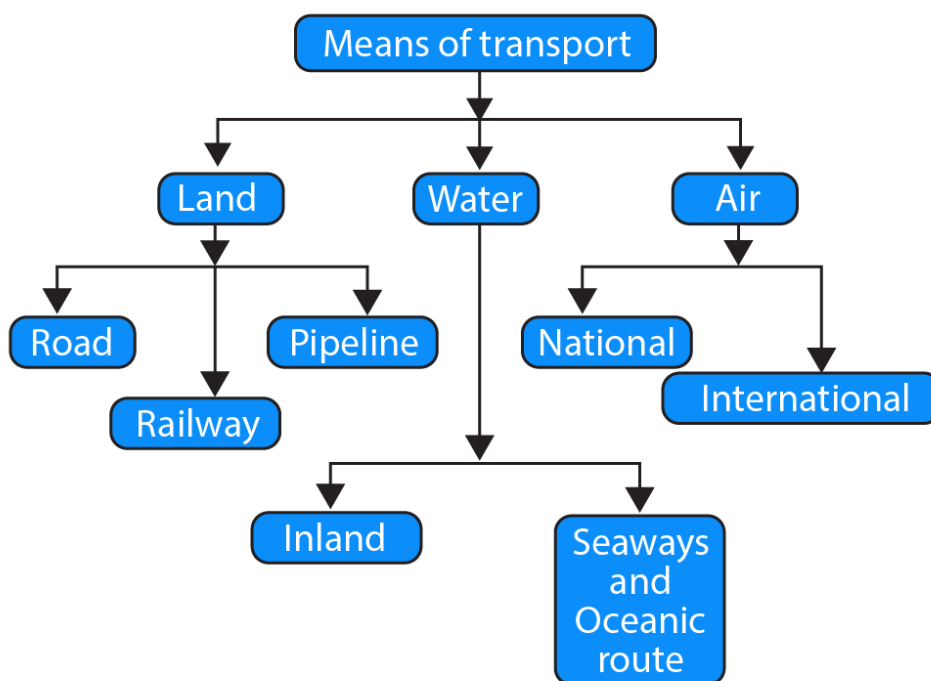


Fig. 10.1: Means of Transport

of defence men and material in strategic areas.

- These also connect the state capitals, major cities, important ports, railway junctions, etc.
- They constitute only **about 2 per cent** of the **total road length** but carry **40 per cent of the road traffic**.
- The length of the National Highways has increased from 19,700 km in 1951 to 101,011 km in 2016.
- **National Highways Authority of India (NHAI):**
 - It was operationalised in 1995 and is an **autonomous body** under the Ministry of Surface Transport.
 - It is entrusted with the responsibility of development, maintenance, and **operation of National Highways**.
 - This is also the apex body to improve the quality of the roads designated as National Highways.

State Highways:

- These are constructed and maintained by **state governments**.
- They join the **state capitals with district headquarters** and other important towns.
- These roads are connected to the National Highways.
- These constitute 4 per cent of total road length in the country.

District Roads:

- These roads are the connecting **link between District Headquarters** and the other important nodes in the district.
- They account for 14 per cent of the total road length of the country.

Rural Roads:

- These roads are vital for providing links in the rural areas.
- About **80 per cent of the total road length** in India are categorised as **rural roads**.
- There is regional variation in the density of rural road because these are influenced by the nature of the terrain.

Other Roads: These include Border Roads and International Highways.

- The **Border Road Organisation (BRO)** was established in **May 1960** for accelerating economic development and strengthening **defence preparedness** through rapid and coordinated improvement of strategically important roads along the northern and north-eastern boundary of the country.
 - It is a **premier multifaceted construction agency**.
 - It has constructed roads in high altitude mountainous terrain joining Chandigarh with Manali (Himachal Pradesh) and Leh (Ladakh).
 - The BRO also undertakes snow clearance in high altitude areas.
- The international highways are meant to promote the harmonious relationship with the neighbouring countries by providing effective links with India.

Rail Transport:

- Indian Railways, network is one of the longest in the world. The length of Indian Railways network was 66,030 km as on 31 March 2015.

Table 10.1: India Road Network 2016

Serial No.	Road Category	Length in Km
1.	National Highways	101011
2.	State Highways	176166
3.	Major District Roads	561940
4.	Rural Roads	3935377
	Total	4774454

- It facilitates the movement of both freight and passengers and contributes to the growth of the economy.
- Indian Railway was introduced in **1853**, when a line was constructed from **Bombay to Thane**.
- Indian Railways is the largest government undertaking in the country.
- Its large size puts a lot of pressure on a centralised railway management system. Thus, in India, the railway system has been divided into **different zones**.
 - This step has increased the speed and the haulage capacity.
- Metro rail has revolutionised the urban transport system in Kolkata and Delhi.
- Railway network is relatively less dense in the hill states, north eastern states, central parts of India and Rajasthan.

Water Transport:

- Waterways is an important mode of transport for both passenger and cargo traffic in India.
- It is the **cheapest means of transport** and is most suitable for carrying **heavy and bulky material**.
- It is a **fuel-efficient** and **eco-friendly** mode of transport.

The water transport is of two types—**Inland waterways**, and **Oceanic waterways**.

Inland Waterways:

- It was the chief mode of transport before the advent of railways.
 - It, however, faced tough competition from road and railway transport.

**Table 10.2: Indian Railways: Railway Zones and Headquarters**

Railway Zone	Headquarters
Central	Mumbai CST
Eastern	Kolkata
East Central	Bhubaneswar
Northern	New Delhi
North Central	Allahabad
North Eastern	Gorakhpur
North East Frontier	Maligaon (Guwahati)
North Western	Jaipur
Southern	Chennai
South Central	Secunderabad
South Eastern	Kolkata
South East Central	Bilaspur
South Western	Hubli
Western	Mumbai (Church Gate)
West Central	Jabalpur

- Moreover, diversion of river water for irrigation purposes made them non-navigable in large parts of their courses.
- India has **14,500 km of navigable waterways**, contributing about 1% to the country's transportation.
- It comprises rivers, canals, backwaters, creeks, etc.
- At present, 5,685 km of major rivers are navigable by mechanised flat bottom vessels.
- The **Inland Waterways Authority** was set up in **1986** for the development, maintenance, and regulation of national waterways in the country.
- The backwaters (Kadal) of Kerala have special significance in Inland Waterway.
 - Apart from providing cheap means of transport, they are also attracting a large number of tourists in Kerala.
 - The famous Nehru Trophy Boat Race (VALLAMKALI) is also held in the backwaters.

Oceanic Routes:

- India has a vast coastline of approximate **7,517 km**, including islands.
- Twelve major and 185 minor ports provide infrastructural support to these routes.

Table 10.3: National Waterways of India

Waterways	Stretch	Specification
NW 1	Allahabad-Haldia stretch (1,620km)	It is one of the most important waterways in India, which is navigable by mechanical boats up to Patna and by ordinary boats up to Haridwar. It is divided into three parts for developmental purposes- (i) Haldia-Farakka (560km), (ii) Farakka-Patna (460km), (iii) Patna – Allahabad (600km)
NW 2	Sadiya-Dhubri stretch (891km)	Brahmaputra is navigable by steamers upto Dibrugarh (1,384 km) which is shared by India and Bangladesh
NW3	Kottapuram – Kollam stretch (205 km)	It includes 168km of west coast canal along with Champakara canal (14 km) and Udyogmandal canal (23 km)
NW 4	Specified stretches of Godavari and Krishna rivers along with Kakinada Puducherry stretch of canals (1078 km)	
NW 5	Specified stretches of river Brahmani along with Matai river, delta channels of Mahanadi and Brahmani rivers and East Coast canal (588 km)	

- Oceanic routes play an important role in the transport sector of India's economy.
 - Approximately **95 per cent of India's foreign trade by volume** and **70 per cent by value** moves through ocean routes.

Air Transportation:

- Air transport is the **fastest means of movement** from one place to the other.
- It has **reduced distances** by minimising the travel time.
- It is essential for a vast country like India, where distances are large, and the terrain and climatic conditions are diverse.
- Air transport in India made a **beginning in 1911** when **airmail operation** commenced over a little distance of 10 km between **Allahabad and Naini**.
- **Airport Authority of India:**
 - It is responsible for providing safe, efficient air traffic and aeronautical communication services in the Indian Air Space.
 - The authority manages 125 airports.
- Air India provides International Air Services for both passengers and cargo traffic.
 - It connects all the continents of the world through its services.
- **Pawan Hans** is the **helicopter service** operating in hilly areas and is widely used by tourists in north-eastern sector.
 - Pawan Hans Limited mainly provides helicopter services to petroleum sector and for tourism.

Oil and Gas Pipeline:

- Pipelines are the most convenient and efficient mode of **transporting**

liquids and gases over **long distances**. Even solids can also be transported by pipelines after converting them into slurry.

- **Oil India Limited (OIL)** under the administrative set up of the Ministry of Petroleum and Natural Gas is engaged in the exploration, production and transportation of **crude oil and natural gas**.
 - **Asia's first cross country pipeline** covering a distance of 1,157 km was constructed by OIL from **Naharkatiya oilfield** in Assam to **Barauni refinery** in Bihar. It was further extended up to Kanpur in 1966.
- Another extensive network of pipelines has been constructed in the western region of India like Ankleshwar-Koyali, Mumbai High Koyali and Hazira-Vijaipur-Jagdishpur (HVJ).
- Recently, a 1256 km long pipeline connecting Salaya (Gujarat) with Mathura (U.P.) has been constructed.

Communication Networks:

- Invention of post office, telegraph, printing press, telephone, satellite, etc has made the communication much faster and easier.
- Development in the field of science and technology has significantly contributed in bringing about revolution in the field of communication.

Division of Mode of Communication based on the Scale and Quality

Personal Communication System:

Among all the personal communication system internet is the most effective

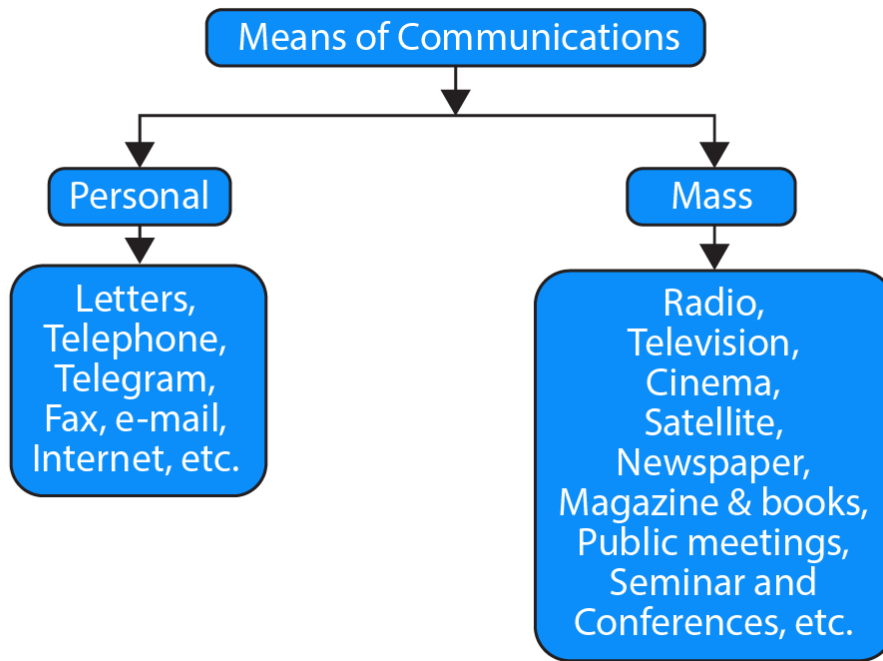


Fig.10.2: Means of Communication

and advanced one. It is widely used in urban areas.

- It enables the user to establish direct contact through e-mail to get access to the world of knowledge and information.
- It is increasingly used for ecommerce and carrying out money transactions.
- The internet is like a huge central warehouse of data, with detailed information on various items.

Mass Communication System

Radio:

- Radio broadcasting **started in India in 1923** by the **Radio Club of Bombay**.
- Government took the opportunity and brought this popular mode of communication under its control in **1930** under the **Indian Broadcasting System**.

- It was changed to **All India Radio in 1936** and to **Akashwani in 1957**.

- All India Radio broadcasts a variety of programmes related to information, education, and entertainment.
- Special news bulletins are also broadcast at specific occasions like session of parliament and state legislatures.

Television:

- Television broadcasting has emerged as the most **effective audio-visual medium** for disseminating information and educating masses.
- In **1976**, TV was delinked from All India Radio (AIR) and got a **separate identity** as **Door darshan (DD)**.
- After INSAT-1A (National Television-DD1) became operational, Common National Programmes (CNP) were started for the

entire network and its services were extended to the backward and remote rural areas.

Satellite Communication:

- Satellites are mode of communication in themselves as well as they regulate the use of other means of communication.
- The use of satellite in getting a continuous and synoptic view of larger area has made satellite communication very vital for the country due to the **economic and strategic reasons**.
 - Satellite images can be used for the weather forecast, monitoring of natural calamities, surveillance of border areas, etc.

On the basis of configuration and purposes, satellite system in India can be grouped into two: Indian National Satellite System (INSAT) and Indian Remote Sensing Satellite System (IRS).

- The INSAT, which was established in **1983**, is a multi-purpose satellite system for telecommunication, meteorological observation and for various other data and programmes.
- The IRS satellite system became operational with the launching of IRS-IA in March 1988 from Vaikanour in Russia.
- The National Remote Sensing Centre (NRSC) at Hyderabad provides facilities for acquisition of data and its processing. These are very useful in the management of natural resources.

Interesting Points:

- **Grand Truck Road:**
 - **Sher Shah Suri** built the **Shahi (Royal) road** to strengthen and consolidate

his empire from the Indus Valley to the Sonar Valley in Bengal.

- This road was renamed the **Grand Trunk (GT) road** during the British period, **connecting Calcutta and Peshawar**.
- At present, it extends from **Amritsar to Kolkata**. It is bifurcated into **2 segments**: (a) National Highway (NH)-1 from Delhi to Amritsar (b) NH- 2 from Delhi to Kolkata.
- **Bharatmala:** It is a proposed umbrella scheme for:
 - Border areas, including connectivity of nonmajor ports.
 - Backward areas religious and tourist places connectivity programme.
 - Setubharatam Pariyojana, which is for the consruction of about 1500 major bridges and 200 rail over bridges rail under bridges. District Headquarters connectivity Scheme for the development of about 9000 km newly declared National Highways.
- On the basis of the width of track of the Indian Railways, three categories have been made:
 - **Broad gauge:** The distance between rails in broad gauge is 1.676 metre. The total length of broad-gauge lines was 60510 km in March 2016.
 - **Metre gauge:** The distance between rails is one metre. Its total length was 3880 km in March 2016.
 - **Narrow gauge:** The distance between the rails in this case is 0.762 metre or 0.610 metre. The total length of narrow guage was 2297 km in March 2016. It is generally confined to hilly areas.



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- **Konkan Railways:**
 - Indian Railways has been the construction of **Konkan Railway** in **1998**.
 - It is 760-km long rail route connecting Roha in Maharashtra to Mangalore in Karnataka.
 - It crosses 146 rivers, streams, nearly 2000 bridges and 91 tunnels.
 - **Asia's largest tunnel**, which is nearly 6.5 km long, also lies on this route.
 - The states of Maharashtra, Goa and Karnataka are partners in this undertaking.
 - In **1953**, Air transport was **nationalised** and two Corporations, Air India International and Indian Airlines were formed. Now Indian Airlines is known as 'Indian'.



International Trade is mutually beneficial as no country is self-sufficient. India's international trade has undergone a sea change in recent years in terms of volume, composition and direction.

India's Trade Pattern:

In 1950-51, India's external trade was worth Rs.1,214 crore, which rose to Rs. 44,29,762 crores in 2016-17.

- **Reasons for rise in Overseas Trade:**
 - The momentum picked up by the manufacturing sectors.
 - The liberal policies of the government.
 - The diversification of markets.
- Though there has been an increase in the total volume of import and export, the value of import continued to be higher than that of exports.

Changing Pattern of the Composition of India's Exports:

The composition of commodities in India's international trade has been changed over the years.

- The share of **agriculture and allied products** has **declined**, whereas **shares of petroleum** and crude products and other commodities **have increased**.
- The shares of **ore minerals and manufactured goods** have largely remained **constant** over the years from 2009-10 to 2010-11 and 2015-16 to 2016-17.
- Amongst the Agricultural Products:
 - There is a decline in the export of traditional items, such as coffee, cashew, etc.
 - An increase has been registered in floricultural products, fresh fruits, marine products, and sugar, etc.

- Manufacturing sector alone accounted for 73.6 per cent of India's total value of export in 2016-17.
- Engineering goods have shown a significant growth in the export.
- Gems and jewellery contribute a larger share of India's foreign trade.
- China and other East Asian countries are our major competitors.

Changing Patterns of The Composition of India's Import:

- India faced serious food shortage during 1950s and 1960s.
 - The **major item of import** at that time was food grain, capital goods, machinery and equipment.
 - The **balance of payment** was **adverse** as imports were more than export in spite of all the efforts of import substitution.
- **After 1970s:**
 - **Food grain import was discontinued** due to the success of Green revolution.
 - The energy crisis of 1973 pushed the prices of petroleum.
 - The import budget was also pushed up.
 - Food grain import was replaced by fertilisers and petroleum.
 - Machine and equipment, special steel, edible oil and chemicals largely make the import basket.
- **In Recent Years:**
 - There is a **steep rise in the import of petroleum products**.
 - Import of capital goods maintained a steady increase due to rising demand in the export-oriented industrial and domestic sectors.

- Non-electrical machinery, transport equipment, manufacturers of metals and machine tools were the main items of capital goods.
- Import of food and allied products declined with a fall in imports of edible oils.
- Other major items of India's import include pearls and semi-precious stones, gold and silver, metalliferous ores and metal scrap, non-ferrous metals, electronic goods, etc.

Direction of Trade:

- India has trade relations with most of the countries and major trading blocks of the world.
- India **aims to double its share** in the international trade within the **next five years**. It has already started adopting suitable measures such as import liberalisation, reduction in import duties, delicensing and change from process to product patents.
- Most of India's foreign trade is carried through sea and air routes. However, a small portion is also carried through land route to neighbouring countries like Nepal, Bhutan, Bangladesh and Pakistan.

Sea Ports as Gateways of International Trade:

India is surrounded by sea from three sides and is bestowed with a long coastline.

- Water provides a smooth surface for very **cheap transport** provided there is **no turbulence**.
- India has a long tradition of sea faring and developed many ports with place

name suffixed with **pattan** meaning **port**.

- India's **west coast** has **more ports** than its east coast.
- The emergence of ports as gateways of international trade became important after the coming of the **European traders** and colonisation of the country by the British.
 - This led to the variation in the size and quality of ports.
- At present, India has 13 major ports and 200 minor or intermediate ports.
- **Major Ports:**
 - The **central government** decides the policy and plays regulatory functions.
 - The major ports handle larger share of the total traffic.
- **Minor Ports:**
 - Whose policy and functions are regulated by state governments.
- To compensate loss of Karachi and Chittagong port India developed Kandla and diamond harbour near Kolkata on river Hugli.

Important Ports

Kandla Port:

- It is situated at the head of **Gulf of Kutch** and has been developed as a major port to cater to the needs of western and north western parts of India and also to **reduce the pressure** at Mumbai port.
- It is specially designed to receive **large quantities of petroleum** and petroleum products and fertiliser.
- The offshore terminal at Vadinar has been developed to reduce the pressure at Kandla port.

Mumbai Port:

- Mumbai is a **natural harbour** and the biggest port of India.
- It is situated closer to the general routes from the countries of Middle East, Mediterranean countries, North Africa, North America, and Europe.
- The port is 20 km long and 6-10 km wide with 54 berths and has the country's largest oil terminal.
- **Main Hinterland of Mumbai Port:** M.P., Maharashtra, Gujarat, U.P. and parts of Rajasthan.

Jawaharlal Nehru Port at Nhava Sheva:

- It was developed as a **satellite port** to relieve the pressure at the Mumbai port.
- It is the **largest container port** in India.

Marmagao Port:

- It is situated at the entrance of the **Zuari estuary** and is a **natural harbour** in Goa.
- It gained significance after its remodelling in 1961 to handle iron-ore exports to Japan.
- Construction of Konkan railway has considerably extended the hinterland of this port.
- **Main Hinterland:** Karnataka, Goa, Southern Maharashtra.

New Mangalore Port

- It is located in the state of Karnataka and caters to the needs of the export of iron-ore and iron-concentrates.
- It also handles fertilisers, petroleum products, edible oils, coffee, tea, wood pulp, yarn, granite stone, molasses, etc.
- **Karnataka** is the **major hinterland** for this port.

Kochchi Port:

- It is situated at the head of **Vembanad Kayal**, popularly known as the 'Queen of the Arabian Sea' and is also a **natural harbour**.
- It has an advantageous location being close to the **Suez-Colombo route**.
- It caters to the needs of Kerala, Southern Karnataka and South Western Tamil Nadu.

Ports on Eastern Coast**Kolkata Port:**

- It is located on the **Hugli river**, 128 km inland from the Bay of Bengal.
- Like the Mumbai port, this port was also developed by the British.
- Kolkata had the initial advantage of being the capital of British India.
- The port has **lost its significance** considerably on account of the diversion of exports to the other ports such as Vishakhapatnam, Paradwip and its satellite port, Haldia.
- It is also confronted with the **problem of silt accumulation** in the Hugli river which provides a link to the sea.
- Its **hinterland** covers U.P., Bihar, Jharkhand, West Bengal, Sikkim, and the north-eastern states.
- It also extends ports facilities to our neighbouring land-locked countries such as Nepal and Bhutan.

Haldia Port:

- It is located 105 km downstream from Kolkata.
- It has been constructed to reduce the congestion at Kolkata port.
- It handles **bulk cargo** like iron ore, coal, petroleum, petroleum products and

fertilisers, jute, jute products, cotton, and cotton yarn, etc.

Paradwip Port:

- It is situated in the **Mahanadi delta**, about 100 km from Cuttack.
- It has the **deepest harbour** especially suited to handle **very large vessels**.

- It has been developed mainly to handle large-scale **export of iron-ore**.
- Odisha, Chhattisgarh, and Jharkhand are the parts of its hinterland.

Visakhapatnam Port:

- It is located in Andhra Pradesh and is a **land-locked harbour**, connected to the



Fig. 11.1: Major Ports



sea by a channel cut through solid rock and sand.

- An outer harbour has been developed for handling iron-ore, petroleum, and general cargo.
- Andhra Pradesh and Telangana are the main hinterland for this port.

Chennai Port:

- It is one of the oldest ports on the eastern coast.
- It is an artificial harbour built in 1859.
- It is **not much suitable for large ships** because of the shallow waters near the coast.
- Tamil Nadu and Puducherry are its hinterland.

Ennore:

- It is a newly developed port in Tamil Nadu and has been constructed 25 km north of Chennai to relieve the pressure at Chennai port.

Tuticorin Port:

- It was also developed to relieve the pressure of Chennai port.

- It deals with a **variety of cargo**, including coal, salt, food grains, edible oils, sugar, chemicals, and petroleum products.

Airports:

- Air transport plays an important role in the international trade.
- It has the advantage of taking the **least time for carriage** and handling high value or perishable goods **over long distances**.
- It is **very costly** and **unsuitable for carrying heavy** and bulky commodities which ultimately reduces the participation of this sector in the international trade as compared to the oceanic routes.
- There were 25 major airports functioning in the country (Annual Report 2016-17).
 - They are Ahmedabad, Bengaluru, Chennai, Delhi, Goa, Guwahati, Hyderabad, Kolkata, Mumbai, Thiruvananthapuram, Srinagar, Jaipur, Calicut, Nagpur, Coimbatore, Cochin, Lucknow, Pune, Chandigarh, Mangalore, Vishakhapatnam, Indore, Patna, Bhubaneswar, and Kannur.



Unit: V



12

Geographical Perspective on Selected Issues and Problems

Environmental Pollution:

Environmental pollution results from 'the release of substances and energy from waste products of human activities.

Classification of Pollution:

It is based on medium through which pollutants are transported and diffused: Air pollution, water pollution, land pollution and noise pollution.

Water Pollution:

- Indiscriminate use of water by increasing population and industrial expansion has led degradation of the quality of water considerably.
- Surface water available from rivers, canals, lakes, etc. is never pure.
 - It contains small quantities of suspended particles, organic and inorganic substances.
 - When concentration of these substances increases, the water becomes polluted, and hence becomes unfit for use.
- Water Pollutants are created from:
 - **Natural Sources:** Erosion, landslides, decay and decomposition of plants and animals, etc.
 - **Anthropogenic:** Human beings pollute the water through industrial, agricultural, and cultural activities. Among these activities, industry is the most significant contributor.

Industrial Pollution:

- Industries produce several undesirable products including industrial wastes, polluted waste water, poisonous gases, chemical residuals, numerous heavy metals, dust, smoke, etc.

- Most of the industrial wastes are disposed of in running water or lakes.
 - The poisonous elements reach the reservoirs, rivers, and other water bodies, which destroy the bio-system of these waters.
- **Major Water Polluting Industries:** leather, pulp and paper, textiles, and chemicals.

Other Source of Pollution:

- Various types of chemicals used in modern agriculture such as inorganic fertilisers, pesticides and herbicides are also pollution generating components.
- Fertiliser induces an increase in the nitrate content of surface waters.
- Cultural activities such as pilgrimage, religious fairs, tourism, etc. also cause water pollution.

Effects of Water Pollution:

- Water pollution is a source of various **water-borne diseases**.
- The diseases commonly caused due to contaminated water are diarrhoea, intestinal worms, hepatitis, etc.
- The World Health Organization shows that about one-fourth of the communicable diseases in India are water-borne.

Air pollution:

- Air pollution is taken as **addition of contaminants**, like dust, fumes, gas, fog, odour, smoke or vapour to the air in substantial proportion and duration that may be harmful to flora and fauna and to property.
- There is a marked **increase in emission of toxic gases** into the atmosphere due

to increasing use of varieties of fuels as the source of energy.

- **Main Source of Pollution:** Combustion of fossil fuels, mining and industries.
 - These processes release oxides of sulphur and nitrogen, hydrocarbons, carbon dioxide, carbon monoxide, lead and asbestos.

Effects of Air Pollution:

- Air pollution causes **various diseases** related to respiratory, nervous, and circulatory systems.
- Smoky fog over cities called as urban smog is caused by atmospheric pollution. It proves very harmful to human health.
- Air pollution can also cause acid rains.
 - Rainwater analysis of urban environment has indicated that pH value of the first rain after summer is always lower than the subsequent rains.

Noise Pollution:

- Noise pollution refers to the state of unbearable and uncomfortable to human beings which is caused by noise from different sources.
- **Main Sources of Noise Pollution:** various factories, mechanised construction and demolition works, automobiles and aircraft, etc.
 - There may be added periodical but polluting noise from sirens, loudspeakers used in various festivals, programmes associated with community activities.
- The level of steady noise is measured by sound level expressed in terms of **decibels (dB)**.

- In sea traffic, the noise pollution is confined to the harbour due to loading and unloading activities being carried.
- Noise pollution is location specific and its intensity declines with increase in distance from the source of pollution, i.e., industrial areas, arteries of transportation, airport, etc.

Urban Waste Disposal:

- **Solid waste** refers to a **variety of old and used articles**, for example–stained small pieces of metals, broken glassware, plastic containers, polythene bags, ash, floppies, CDs, etc., dumped at different places.
- These discarded materials are also termed as refuse, garbage, and rubbish, etc., and are disposed of from two sources:
 - **Household or Domestic Establishments:** The household wastes are disposed of either on public lands or on private contractors' sites.
 - **Industrial or Commercial Establishments:** The solid wastes of industrial units are collected and disposed of through public (municipal) facilities at low lying public grounds (landfill areas).

Effects of Solid Waste:

- Solid wastes cause **health hazard** through creation of obnoxious smell, and harbouring of flies and rodents, which act as carriers of diseases like typhoid, diphtheria, diarrhoea, malaria, and cholera, etc.
- These wastes cause frequent nuisance as and when these are carelessly

handled, spread by wind and splattered through rainwater.

The dumping of industrial waste into rivers leads to water pollution.

- In India, about 30 to 50 per cent of the waste generated are left uncollected which accumulate on streets, in open

spaces between houses and in wastelands leading to serious health hazards.

- These wastes should be treated as resource and utilised for generating energy and compost.
- Untreated wastes ferment slowly and release toxic biogas to the atmosphere, including methane.

Table 12.1: Types and Sources of Pollution

Pollution Types	Pollution Invoked	Sources of Pollution
Air Pollution	Oxides of sulphur (SO ₂ SO ₃) Oxides of nitrogen. carbon monoxide. hydro-carbon. ammonia lead aldehydes asbestos and beryllium	Combustion of coal. petrol and diesel. industrial processes. solid waste disposal. sewage disposal. etc.
Water Pollution	Odour. dissolved and suspended solids. ammonia and urea. nitrate and nitrites. chloride. fluoride. carbonates. oil and grease. Insecticide and pesticide residue. tannin. conform MPH (bacterial count) sulphates and sulphides. heavy metals e.g. lead. arsenic. mercury- manganese. etc.. radioactive substances.	Sewage disposal. urban run-off. toxic effluents from industries. run-off over cultivated lands and nuclear power plants.
Land Pollution	Human and animal excreta viruses and bacteria. garbage and vectors therein. pesticides and fertiliser-residue alkalinity, fluorides. radioactive substances,	Improper human activities. disposal of untreated industrial waste. Use of pesticides and fertilisers.
Noise pollution	High level of noise above tolerance level.	Aircrafts, automobiles, trains. Industrial processing and advertising media.

**Table 12.2: Sources of Pollution in the Ganga and the Yamuna Rivers**

River and State	Polluted Stretches	Nature of Pollution	Main Polluters
Ganga (Uttar Pradesh) Bihar and West Bengal	a. Downstream of Kanpur b. Downstream of Varanasi c. Farrakka Barrage	1. Industrial Pollution from towns like Kanpur 2. Domestic wastes from urban centres 3. Dumping of carcasses in the river	Cities of Kanpur, Allahabad, Varanasi, Patna and Kolkata release domestic waste into the river
Yamuna (Delhi) and Uttar Pradesh	a. Delhi to Confluence with Chambal b. Mathura and Agra	1. Extraction of water by Haryana and Uttar Pradesh for irrigation 2. Agricultural runoff resulting in high levels of micro-pollutants in the Yamuna 3. Domestic and Industrial waste of Delhi flowing into the river	Delhi dumping its domestic waste

Rural- Urban Migration:

Population flow from rural to urban areas is caused by many factors:

- High demand for labour in urban areas.
- Low job opportunities in rural areas.
- Unbalanced pattern of development between urban and rural areas.

Problems of Slums:

- Slums are residential areas of the **least choice**, dilapidated houses, poor hygienic conditions, poor ventilation, lack of basic amenities, like drinking water, light, and toilet facilities, etc.
- **Serious Health and Socio-Environmental Hazards:** Open defecation, unregulated

drainage system and overcrowded narrow street patterns.

- Most of the slum population works in low-paid, high risk-prone, unorganised sectors of the urban economy and cannot afford to give proper education to their children.
- The poverty makes them vulnerable to drug abuse, alcoholism, crime, vandalism, escapism, apathy, and ultimately social exclusion.

Land Degradation:

- The pressure on agricultural land increases not only due to the limited availability but also by deterioration of quality of agricultural land.
 - Soil erosion, waterlogging, salinisation and alkalinisation of land lead to land degradation.
- Land degradation is generally understood either as a temporary or a permanent decline in productive capacity of the land.
- Though all degraded land may not be wasteland, but unchecked process of degradation may lead to the conversion to wasteland.
- There are two processes that induce land degradation.
 - **Natural:** There are a few types of wastelands such as gullied /ravineous land, desertic or coastal sands, barren rocky areas, steep sloping land, and glacial areas, which are primarily caused by natural agents.
 - **Created by Human Beings:** There are wastelands such as degraded shifting cultivation area, degraded land under plantation crops, degraded forests,

degraded pastures, and mining and industrial wastelands, which are caused by human action.

- National Remote Sensing Centre (NRSC) has classified wastelands by using remote sensing techniques.
- The degraded lands such as waterlogged and marshy areas, land affected by salinity and alkalinity and land with or without scrub, which have largely been caused by natural as well as human factors.

Interesting Points:

- The **Swachh Bharat Mission (SBM)** is part of the **urban renewal mission** launched by the Government of India to improve the quality of life in urban slums.
- In India, it is estimated that after 1961 around 60 per cent of the urban growth has been attributed and 29 per cent of them from rural areas to urban migration.
- By 2050, an estimated two-thirds of the world's population will live in urban areas.
- **Namami Gange Programme:** Ganga, as a river, has national importance but the river requires cleaning by effectively controlling the pollution for its water. The Union Government has launched the 'Namami Gange Programme' with the following objectives:
 - Developing sewerage treatment systems in towns.
 - Monitoring of industrial effluents.
 - Development of river front.
 - Afforestation along the bank of increase biodiversity.

-
- Cleaning of the river surface.
 - Development of 'Ganga Grams' in Uttarakhand, UP, Bihar, Jharkhand and West Bengal.
 - Creating public awareness to avoid adding pollutants into the river even in the form of rituals.
- **Polluters Pays law:** The 'polluter pays' principle is the commonly accepted practice that those who produce pollution should bear the costs of managing it to prevent damage to human health or the environment.